ORDER NO. VRD-7810-303

Service Manual

Video Cassette Recorder
Panasonic
Omnivision IV VHS™
PV-1100

Vol. 1

Summary
Technical Descriptions

SPECIFICATIONS

Power Source: 120 VAC ± 10%, 60 Hz ± 0.5%
Power Consumption: Approx. 29 watts
Television System: EIA Standard (525 lines, 60 fields)
NTSC color signal
Video Recording System: 2 rotary heads helical scanning system
Luminance: FM azimuth recording
Chrominance: Converted subcarrier phase shift recording
Audio Track: 1 track
Tape Format: Tape width 1/2″ (12.7 mm), high density tape
Tape Speed: SP mode: 1-5/16 i.p.s (33.35 mm/s)
LP mode: 21/32 i.p.s (16.67 mm/s)
Record/Playback Time: 1 or 2 hours with NV-T60
2 or 4 hours with NV-T120
FF/REW Time: Less than 4.5 min with NV-T120
Heads: Video: 2 rotary heads
Audio/Control: 1 stationary head
Erase: 1 full track
1 audio track erase for audio dubbing
Input Level: Video: Video IN Connector (RCA type)
1.0 Vp-p, 75 Ω unbalanced
Audio: MIC Jack (1/4″ PHONO JACK)
−70 dB, 600 Ω unbalanced
Audio IN Jack (RCA type)
−20 dB, 100 kΩ unbalanced
TV Tuners: VHF Input: VHF Ch2-Ch13,
65−90 dBμ, 75 Ω unbalanced
UHF Input: UHF Ch14-Ch83,
65−90 dBμ, 300 Ω balanced
Output Level: Video: Video OUT Connector (RCA type)
1.0 Vp-p, 75 Ω unbalanced
Audio: Audio OUT Jack (RCA type)
−6 dB, 600 Ω
unbalanced
RF Modulated: Ch3/Ch4 switchable,
72 dBμ, 75 Ω unbalanced
Video Horizontal Resolution: Color: more than 230 lines
B/W: more than 270 lines
Signal-to-Noise Ratio: Video: SP mode: better than 40 dB
LP mode: better than 40 dB
(Rohde & Schwarz noise meter)
Audio: SP mode: better than 42 dB
LP mode: better than 40 dB
Operation Temperature: 41°F−104°F (5°C−40°C)
Operating Humidity: 10%−75%
Weight: 35.3/4 lbs (16.3 kg)
Dimensions: 19-1/8″(W) × 15-1/2(D) × 6-7/8(H)
(485 mm × 394 mm × 175 mm)
Accessories Supplied:
- Blank tape
- Remote control unit
- 75 Ω −300 Ω matching transformer
- 300 Ω −75 Ω matching transformer
- Coaxial cable (5 ft)
- F type connectors
- Twin lead wire (5 ft)
- Dust cover
- Terminal Block

Available Tapes: 1/2″ VHS video cassette tapes
NV-T120 Approx. 810 ft. (247 m), 2 or 4 hrs.
NV-T60 Approx. 417 ft. (127 m), 1 or 2 hrs.

Weight and dimensions shown are approximate. Specifications are subject to change without notice.

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SUMMARY

Preface

This introduction contains general technical information necessary to understand the basic principles of operation of the VHS Video Cassette Recorder.
Starting with a list of features, the text then explains the fundamentals of basic video tape recording, then follows through with the revolutionary concepts used in VHS.
Through this introduction, the reader will develop a general understanding of the VHS system as it applies to the VHS machines from other manufacturers as well.

Features

1. **4-Hour Recording and Playback**
   The VHS Format allows a recording time of up to 4 hours on a signal video cassette.
2. **Standard Play or Long Play**
   This model is capable of playing tapes made by all other type VHS units by using it in the Standard Play (SP) mode. A special feature of this model is its ability to make double length recordings in the Long Play (LP) mode. An LP recording can only by played on a VHS SP/LP unit.
3. **Direct Drive Head Cylinder**
   The Video Head Cylinder is directly driven by a special, brushless DC motor. This method improves reliability and time base stability.
4. **Aluminum Die-Cast Chassis**
   A Die-Cast Chassis improves overall performance and assures high reliability and longer life.
5. **Easy-to-use Operation Switches**
   These switches make the unit as easy to operate as any conventional audio cassette recorder.
6. **Automatic Stop**
   When recording or playing back or when in fast forward, the unit will automatically stop if the tape reaches its end. When rewinding, the unit will automatically stop at the tape beginning or the memory point.
7. **Tape Counter With Memory**
   The Tape Counter tells you at what point you are in the tape and can be set to stop tape rewinding at the "000" indication.
8. **Pause Control**
   With the Pause Control, the tape can be instantly stopped during recording or playback without unthreading the tape.
9. **Watch One Channel, Record Another**
   With it's built-in VHF/UHF tuners, the unit can record a broadcast on one channel while allowing another channel to be reviewed.
10. **Unattended Recording**
    With its built-in timer, the unit can be set to automatically start recording at any time.
11. **Playback Through Any Conventional TV**
    The switchable (CH3/CH4) RF converter modulates the video signal so that it may be viewed on any conventional TV set.

LOCATION AND OPERATION PROCEDURES

LOCATION

- **Avoid extremes of temperature.**
  If a cold room is rapidly warmed by a heating appliance, or if the unit is suddenly moved from a cold place to a warm room, moisture may form on tape transport surfaces as a result of the sudden temperature change, and the tape may not move smoothly. Be sure, therefore, to avoid such sudden changes in temperature if possible.
- **Use where there is low humidity and dust.**
  Operating the unit in areas of high humidity or dust, may result in damage to internal parts.
- **Use in a level and stable place.**
  Avoid places where the unit will not be level, where it will not be stable, and where it might be subjected to vibration.
- **Don't obstruct the ventilation holes.**
  The ventilation holes prevent abnormal increases of the internal temperature. Do not permit these holes to become blocked, especially by soft material such as cloth or paper.

OPERATION PROCEDURES

- **Keep magnets away.**
  Never bring a magnet or magnetized object near the unit, because they can adversely affect performance.
- **No fingers or other objects inside.**
  Personal injury or damage to the unit could result from touching internal parts of this unit or attempting any type of modification. Never insert any metal object into this unit for any reason.
- **Keep water away.**
  Don't place flower vases, coffee cups, etc. on or near the unit, because damage to the unit—or a shock hazard—may result if liquids should accidentally be spilled into the unit.
- **Cleaning the unit.**
  Wipe the unit with a clean, dry cloth. Never use thinner, benzine, or similar chemicals.

WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

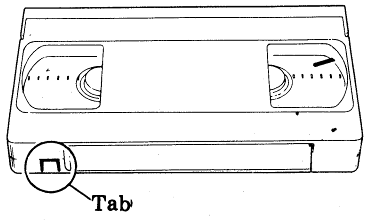
A WORD ABOUT CASSETTE TAPE

"Unauthorized recording of copyrighted television programs, films, video tapes and other materials may infringe the right of copyright owners and be contrary to copyright laws".

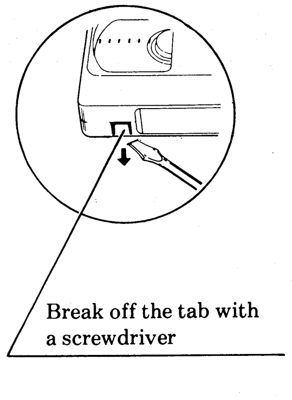
- **Types of video cassette.**
  Use types with the VHS mark in this unit.

Mode	NV-T60	NV-T120
SP	1 Hours	2 Hours
LP	2 Hours	4 Hours

- **Accidental-erase prevention.**
  Video cassettes have a special push-out tab on the back side which, when removed, prevents accidental erasure (by recording) of valuable tape.
  - When a screwdriver or similar tool is used to break off this tab, the erase-prevention mechanism functions, and recordings cannot be made.
  - If, you later want to rerecord a cassette which has been protected as described above, simply cover the hole (where the tab was) with cellophane tape.
- **Notes for cassette use.**
  Video cassettes and their tape are made with high precision. Be sure to observe the following points.
  - Don't subject the tape to unnecessary movement. Don't insert and eject the video cassette over and over again, because to do so may result in tape looseness or scratches on the tape.
  - Never try to disassemble the cassette.
  - Don't open the cassette, touch the tape, or put anything inside the cassette.
- **Cassette storage.**
  - Avoid places where humidity is high or there is dust.
  - Avoid places where there is magnetism (magnet, motor, transformer. speaker, etc.)
  - Avoid dropping the cassette, don't subject it to intense shaking or vibration.
  - Don't place cassettes in direct sunlight, keep them away from sources of heat.
  - Don't store tapes which are unevenly wound, because the tape may become damaged. Wind once again if necessary.
  - Store video cassettes in their box and in an upright position.

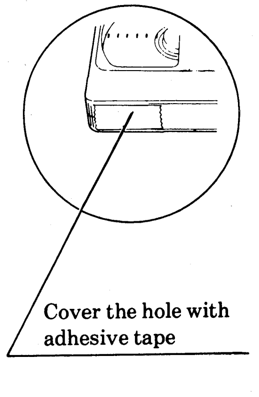


To prevent accidental erasure



Break off the tab with a screwdriver

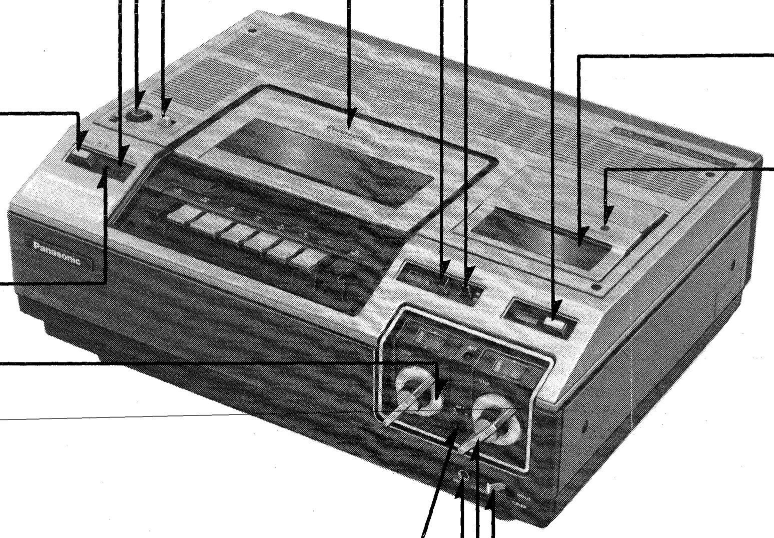
To record again

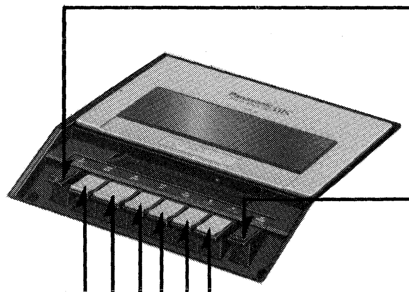


Cover the hole with adhesive tape

MAJOR OPERATING COMPONENTS & THEIR FUNCTIONS

TOP & FRONT VIEW





Cassette Compartment

Recording-Time Selector [LP/SP Mode]
Select the recording time depending upon the length of the program and the amount of unused tape in the cassette.

Tracking Control
Use this control during playback only if streaks appear in the picture. The control is normally left in the center position.

DEW-Indicator Lamp
This lamp will illuminate if dew forms inside the unit. The unit cannot be used while this lamp is illuminated.

Power Switch
The power is turned on by pushing this switch once, and turned off by pushing it once again.

Power-Indicator Lamp
This lamp will illuminate when the power is turned on.

UHF Channel Selector/UHF Fine-Tuning Control (Inner Knob)
Set the VHF channel selector to the "U" position. The desired UHF broadcast can be selected by turning the UHF channel selector. The broadcast can be fine-tuned by pushing and turning the inner control knob.

Automatic Fine-Tuning Switch
Set to "off" before making fine-tuning adjustments. After such adjustments are finished, once again set this switch to the "on" position.

Microphone Jack
For connection of a microphone.

VHF Channel Selector/VHF Fine-Tuning Control (Inner Knob)
The desired VHF broadcast can be selected by turning the VHF channel selector. The broadcast can be fine-tuned by pushing and turning the inner control knob.

Input Selector
VTR TUNER: Set to this position to record a TV broadcast.
CAMERA: Set to this position to record from a video camera and microphone.

Tape Counter/Reset Botton
Pressing this button causes the tape counter to return to "000". By beginning the recording from this "000" point, subsequent playback will be more convenient.

Memory Switch
When this switch is set to the "ON" position, the tape will stop moving, during rewind, when the tape counter indicates "000".

VTR/TV Selector
VTR: Set to this position to monitor the VTR output.
TV: Set to this position to watch TV.

Video Timer (built-in)
Use this timer to make an unattended recording-when away, busy or asleep.

Timer Light
This lamp will illuminate when the video timer is turned on.

Eject Button
Press this button to insert or to remove cassette. It is not possible to eject the cassette while the tape is moving (Playback, Record, Fast Forward, Rewind) always be sure the tape is stopped before activating a function

Pause Button
Press this button to temporarilly stop the tape movement in either the recording or playback modes.
The tape will not unload, but its forward movement will stop. There is no picture produced when pause is in use. Press again to release pause.

Audio-Dubbing Button
When this button is pressed during playback, sound from another source can be recorded on the tape in place of the original sound.

Record Button
Recording is started by pressing this button and the play button at the same time.

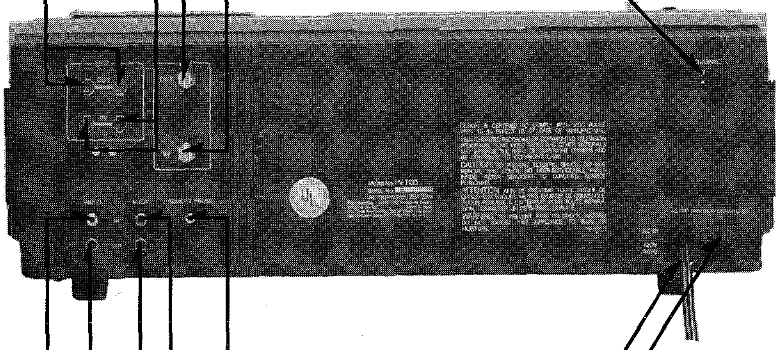
Play Button
Press this button to play back recorded tape. To begin a recording, press this button and the record button at the same time.

Fast Forward Button
Press this button to rapidly move the tape forward.

Stop Button
Press this button to stop the tape.

Rewind Button
Press this button to rewind tape.

REAR VIEW



UHF Antenna Output Terminals
Connect these terminals to the UHF antenna terminals of the TV.

UHF Antenna Input Terminals
Connect the UHF antenna lead to these terminals.

VHF Antenna Output Terminal
Connect this terminal to the VHF antenna terminal of the TV.

VHF Antenna Input Terminal
Connect the VHF antenna to this terminal.

RF Converter Output Selector
Set to the channel (3 or 4) whichever is unused in your area.

AC Outlet
Convenience outlet for another appliance 120V AC and not more than 300 watts.

Power Cord
Connect to 120VAC, 60Hz outlet.

Remote-Control Unit Connection Terminal
By connecting a remote control unit to this terminal, the tape can be temporarilly stopped and started from a distance during play or record.

Audio Input Terminal
For connection of a record player, audio tape recorder, etc.

Audio Output Terminal
For connection to stereo equipment, etc.

Video Output Terminal
For connection to a monitor TV.

Video Input Terminal
For connection of a video camera.

VHS-PRINCIPLE OF OPERATION

Basic Video Tape Recording

To understand the VHS format, it is wise to first review the basic principles of video tape recording.

Like audio tape recording, video information is stored on magnetic tape by means of a small electromagnet, or head. The two poles of the head are brought very close together but they do not touch. This creates magnetic flux to extend across the separation (gap), as shown: Fig. 1.

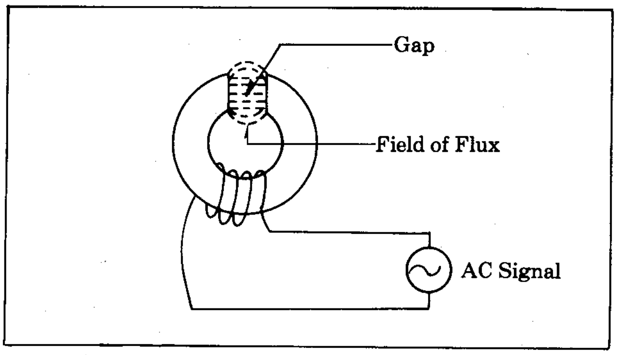


Fig. 1

If an AC signal is applied to the coil of the head, the field of flux will expand and collapse according to the rise and fall of the AC signal. When the AC signal reverses polarity, the field of flux will be oriented in the opposite direction and will also expand and collapse. This changing field of flux is what accomplishes the magnetic recording. If this flux is brought near a magnetic material, it will become magnetized according to the intensity and orientation of the field of flux. The magnetic material used is oxide coated (magnetic) tape. Using audio tape recording as an example, if the tape is not moved across the head, just one spot on the tape will be magnetized and will be continually re-magnetized. If the tape is moved across the tape, specific areas of the tape will be magnetized according to the field of flux at any specific moment. A length of recorded tape will therefore have on it areas of magnetization representing the direction and intensity of the field of flux. For instance:

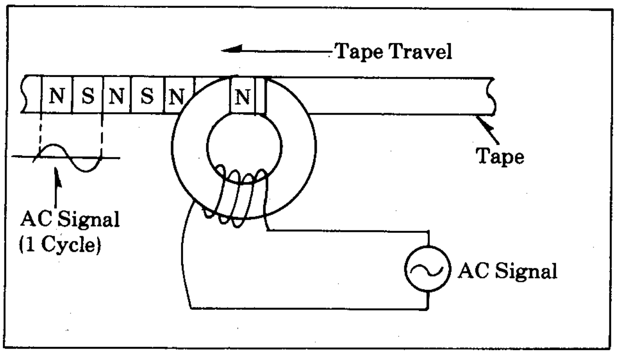


Fig. 2

The tape will have differently magnetized regions, which can be called North (N) and South (S), according to the AC signal. When the polarity of the AC signal changes, so does the direction of magnetization on the tape, as shown by one cycle on the AC signal (see Fig. 2). If the recorded tape is then moved past a head whose coil is connected to an amplifier, the regions of magnetization on the tape will set up flux across the head gap which will in turn induce a voltage in the coil to be amplified. The output of the amplifier, then is the same as the original AC signal. This is essentially what is done in audio recording, with other methods for improvement like bias and equalization.

There are some inherent limitations in the tape recording process which do effect video tape recording, so they will be examined now. As shown in Fig. 2, the tape has North and South magnetic fields which change according to the polarity of the AC signal. What if the frequency of the AC signal were to greatly increase?

If the speed of the tape past the head (head to tape speed) is kept the same, the changing polarity of the high frequency AC signal would not be faithfully recorded on the tape, as shown in Fig. 3.

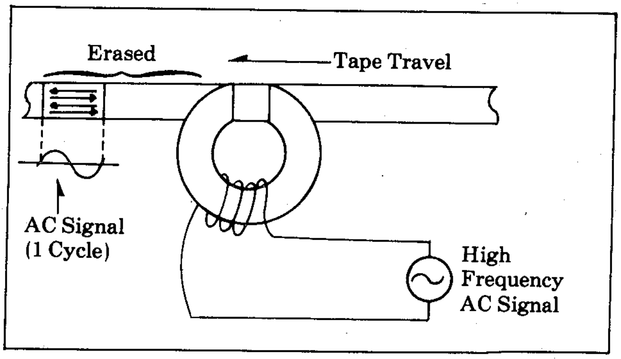


Fig. 3

As the high frequency AC signal starts to go positive, the tape will start to be magnetized in one direction. But the AC signal will very quickly change its polarity, and this will be recorded on much of THE SAME PORTION of the tape, so North magnetic regions will be covered by South magnetic regions and vice versa. This results in zero signal on the tape, or self-erasing. To keep the North and South regions separate, the head to tape speed must be increased. (See Fig. 3.)

When recording video, frequencies in excess of 4MHz may be encountered. Through experience, it is found that the head to tape speed must be in the region of 5 meters per second in order to record video signals.

The figure of 5 meters per second was also influenced by the size of the head gap. Clearly, the lower the head to tape speed, the easier it is to control that speed. If changes in head gap size were not made, the necessary head to tape speed would have been considerably higher. How the gap size influences this can be explained by Fig. 4.

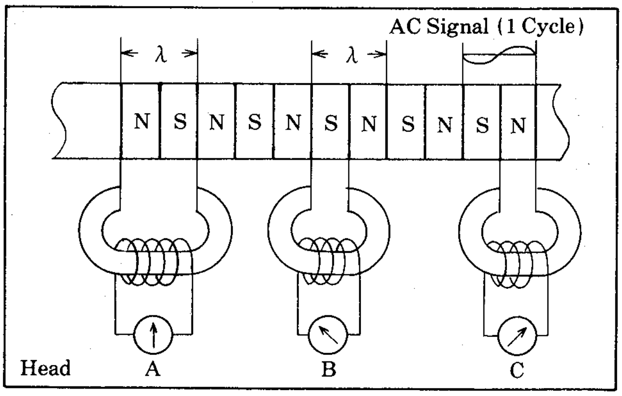


Fig. 4

Assume a signal is already recorded on the tape. The distance on the tape required to record one full AC signal cycle is called the RECORDED WAVELENGTH or λ. Head A has a gap width equal to λ. Here, there is both North and South oriented magnetization across the gap.

This produces a net output of zero since North and South cancel. Heads B and C have a maximum output because there is just one magnetic orientation across their gaps.

Maximum output occurs in heads B and C therefore, because their gap width is $1/2\lambda$. (Heads B and C would also work if their gap width is less than $1/2\lambda$.) The same is also true for recording. The maximum useable (no self-erasing) transfer of magnetic energy to the tape occurs when the gap width, G, can be expressed as.

$$G \leq \frac{\lambda}{2}$$

The RECORDED WAVELENGTH, can be expressed as:

$\lambda = \frac{V}{f}$ where V is the head to tape speed and f is the frequencies to be recorded.

So, $G \leq \frac{V}{2f}$, as V increases, G is also allowed to increase for the same MAXIMUM frequency. Conversely if G is made very small, V is allowed to be reduced.

In practice, G can be made as small as (and smaller than) $0.3\mu m$ (0.3×10^{-6} meters) and this puts V in the area of 5 meters per second. A head to tape speed of 5 meters per second is a very high speed, too high in fact to be handled accurately by a reel to reel tape machine of reasonable size. Also, tape consumption on a high speed reel to reel machine is tremendous.

The method employed in video recording is to move the video heads as well as the tape. If the heads are made to move fast, across the tape, the linear tape speed can be kept very low.

In 2-head helical video recording (the only format which will be discussed here) the video heads are mounted in a rotating drum or cylinder, and the tape is wrapped around the cylinder. This way, the heads can scan the tape as it moves. When a head scans the tape, it is said to have made a TRACK. This can be seen in Fig. 5.

In 2-head helical format, each head, as it scans across the tape will record one TV field, or 262.5 horizontal lines. Therefore, each head must scan the tape 30 times per second to give a field rate of 60 fields per second.

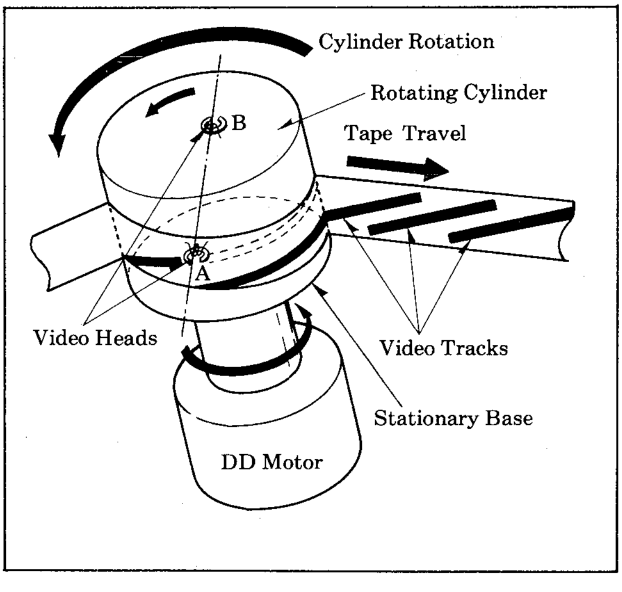


Fig. 5

The tape is shown as a screen wrapped around the head cylinder to make it easy to see the video head. There is a second video head 180° from the head shown in front. Because the tape wraps around the cylinder in the shape of a helix (helical) the video tracks are made as a series of slanted lines. Of course, the tracks are invisible, but it is easier to visualize them as line. The two heads "A" and "B" make alternate scans of the tape.

An enlarged view of the video tracks on the tape can be shown:

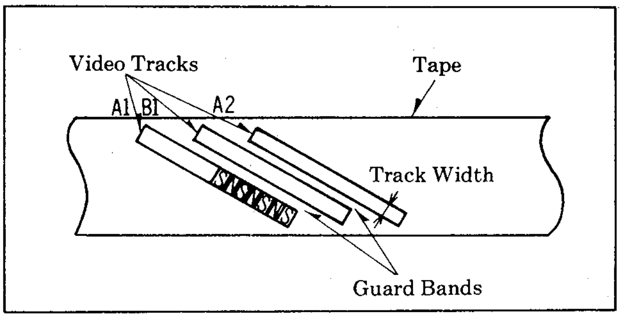


Fig. 6

Refer to Fig. 6. The video tracks are the areas of the tape where video recording actually takes place. The guard bands are blank areas between tracks, preventing the adjacent track's crosstalk from appearing on the track where the video head is tracing.

There is one more point about video recording which will be discussed here. Magnetic heads have the characteristic of increased output level as the frequency increases. Then, as determined by the gap width, the maximum output occurs at approximately $G = \frac{V}{2f}$.

In practice, the lower frequency output of the heads is boosted in level to equal the level of the higher frequencies. This process, as also used in audio applications, is called equalization.

Video frequencies span from DC to about 4MHz. This represents a frequency range of about 18 octaves. 18 octaves is too far a spread to be handled in one system (one machine). For instance, heads designed for operation at a maximum frequency of 4MHz will have very low output at low frequencies. Since there is 6dB/octave attenuation, $18 \times 6 = 108$dB difference appears. In practice this difference is too great to be adequately equalized. To get around this, the video signal is applied to an FM modulator during recording. This modulator will change its frequency according to the instantaneous level of the video signal.

The energy of the FM signal lies chiefly in the area from about 1MHz to 8MHz, just three octaves. Heads designed for use at 8MHz can still be used at 1MHz, because the output signal can be equalized. Actually speaking, heads are designed for use upto about 5MHz. Therefore, some FM energy is lacked but it does not affect the playback video signal much, because information included in high frequency region does not affect so much.

Upon playback, the recovered FM signal must be equalized then demodulated to obtain the video signal.

CONVERTED SUBCARRIER DIRECT RECORDING METHOD

The one method of color video recording that will be discussed here is the converted subcarrier method. In order to avoid visible beats in the picture caused by the interaction of the color (chrominance) and brightness (luminance) signals, the first step in the converted subcarrier method is to separate the chrominance and luminance portions of the video signal to be recorded. The luminance signal, containing frequencies from DC to about 4MHz, is then FM recorded, as previously described. The chrominance portion, containing frequencies in the area of 3.58MHz is down-converted in frequencies in the area of 629kHz. Since there is not a large shift from the center frequency of 629kHz, this converted chrominance signal is able to be recorded directly on the tape. Also note that the frequencies in the area of 629kHz are still high enough to allow equalized playback. In practice, the CONVERTED CHROMINANCE signal and the FM signals are mixed and then simultaneously applied to the tape. Upon playback, the FM and converted chrominance signals are separated. The FM is demodulated into a luminance signal again. The converted chrominance signal is reconverted back up in frequency area of 3.58MHz. The chrominance and luminance signals are combined which reproduces the original video signal.

General Introduction to VHS SP and LP Formats

This model was designed to give the user the capability to make recordings up to 4 hours in length on a signale cassette.

But because there are other VHS recorders available which are not able to make 4 hour recordings, it is desirable to make this model capable of playing back not only its own 4 hour tapes, but also the tapes made by these other VHS units.

In the SP Mode—Maximum of 2 hour record/playback will be performed, just as all other VHS type recorders are able to do. An SP cassette, therefore can be played on all existing VHS units.

In the LP Mode—Maximum of 4 hour record/playback will be performed on a single cassette. An LP cassette can only be played on SP/LP VHS machines.

There are difference between these 2 VHS formats (SP and LP) and they will be pointed out as necessary in the sections that follow.

1. HIGH DENSITY RECORDING SYSTEM

A. Reduction of Track Width

Let's consider first the SP Mode. In order to allow a recording time of up to 2 hours, twice as long as ordinary VTR's, some means of increasing the recording density must be found. Increasing the recording density means that the tape must be more densely filled with information.

One method of accomplishing this is to reduce the video track width and guard band. This way, more tracks can be stored on the tape.

A typical video track width in other helical applications is in the area of 100μm (microns, 1μm $= 1 \times 10^{-6}$ meters).

In VHS/SP, the track width is 38μm. This means that the actual size of the video head must be reduced because the head size determines the track width.

In VHS/LP, the effective track width becomes 29μm. There is no change in head size, but as will be shown later, the useable track area is reduced.

B. Guard Band

The Guard Band in the SP Mode represents wasted space on the tape. This space could be utilized to increase the recording density even more. See Fig. 7.

In the VHS/LP Mode, the guard band is eliminated. The video tracks are brought together so that they actually overlap. Clearly this represents zero guard band. See Fig. 8.

Because the video tracks actually overlap, adjacent track crosstalk becomes a problem. This occurs during playback, when a particular head also picks up information from an adjacent track and the overlapped region. The overlapped region contains information from 2 adjacent tracks which is actually partially erased, but can still be a source of unwanted crosstalk.

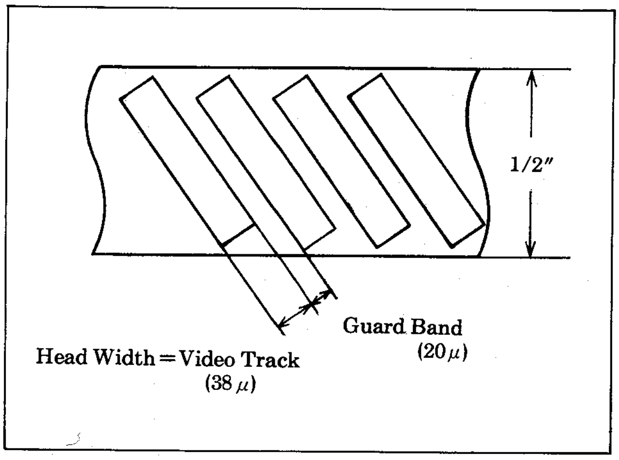


Fig. 7

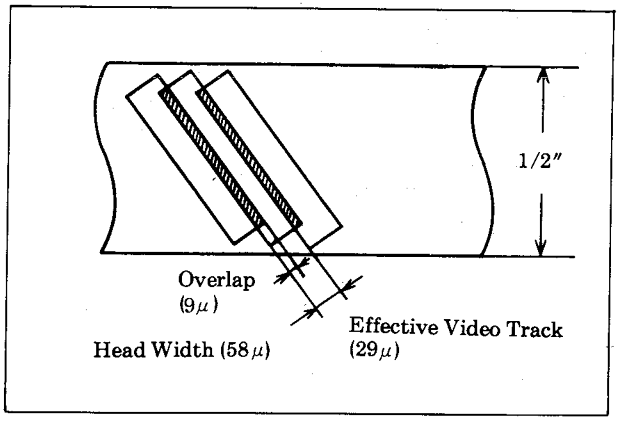


Fig. 8

Because the inadvertent crosstalk does produce undesirable interference on the playback screen, a new recording method is used to prevent the pickup of crosstalk. This new method as will be described later is called Azimuth Recording.

C. Reduction of Tape Speed

In VHS/SP the linear tape speed is 33.35 mm/sec.

Now, for the LP Mode, we must reduce the linear tape speed so that the guard bands disappear, and track overlap occurs.

Linear tape speed in VHS/LP is 16.67 mm/sec.

The reduction of linear tape speed means that less tape moves past the head cylinder per unit time, and since the rotational speed of the heads is unchanged, the tracks become more closely spaced.

The higher the linear tape speed, the wider the guard bands become. The lower the speed, the narrower they become.

2. NEW VIDEO HEADS

A. The Need for New Video Heads

We have already discussed the reduced track width. This reduction requires the use of a smaller video head. Just making them smaller does not make them better. With less of actual head material to work with, the magnetic properties of the head suffers. To offset this a change in the head material is in order. Because the VHS recorder is designed to be small, a reduction in the size of the head cylinder was called for.

A reduction in the size (diameter) of the head cylinder changes the head to tape speed. Remember, the head to tape speed the high frequency recording capability of the head. To offset this problem, the head gap size was reduced.

As mentioned before, Azimuth Recording is utilized in VHS. The heart of the Azimuth Recording process is in the video heads themselves. This requires still another change in head design.

B. Hot Pressed Ferrite

The use of Hot Pressed Ferrite as video head material in VHS helps to improve the characteristics of the smaller head. The Hot Pressed Ferrite also has uniform domain orientation which further improves the head characteristics. It has been proven in many tests that the use of Hot Pressed Ferrite produces a superior video head.

C. Head Gap

1. Width

As explained, the need for smaller head gap size became apparent. In VHS, the video heads have gap widths of a mere 0.3μm (0.3×10^{-6} meters).

This is quite a contrast with ordinary video heads used in other helical applications whose gap widths are typically in the area of 1μm.

2. **Azimuth**

Azimuth is the term used to define the left to right tilt of the gap if the head could be viewed straight on.
In previous VTR applications the azimuth was always set to be perpendicular to the direction of the head travel across the tape, or more simply, the video track. Fig. 9 helps explain this.

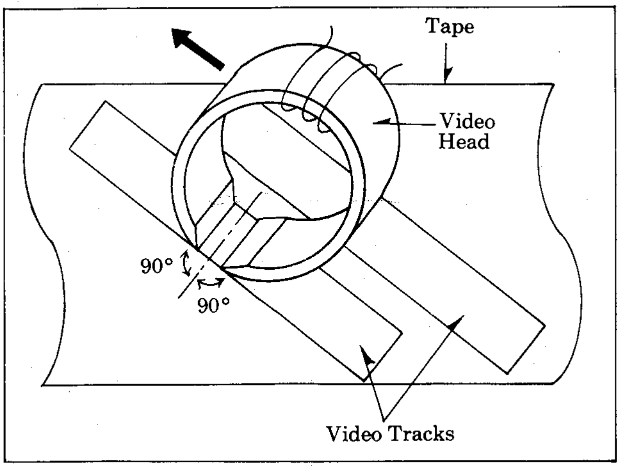


Fig. 9

Fig. 9 shows that the gap is perpendicular to (90°) the head's movement across the tape. We can think of this standard as a perfect azimuth of 0°.
In VHS, the video heads have a gap azimuth other than 0°. And more, one video head has a different azimuth from the other. The 2 values used in VHS are azimuth of +6° and −6°. Refer to Fig. 10 and Fig. 11.

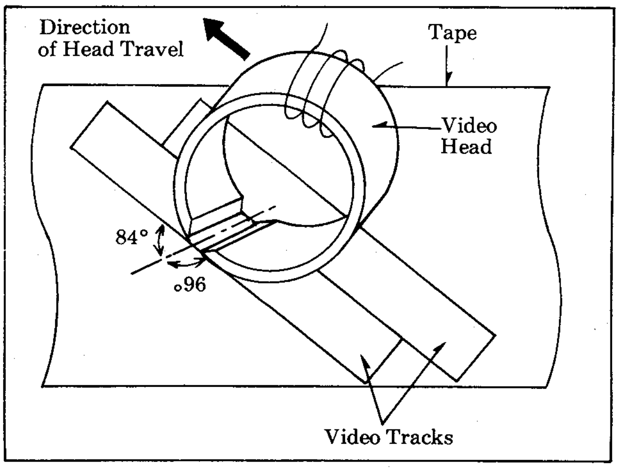


Fig. 10

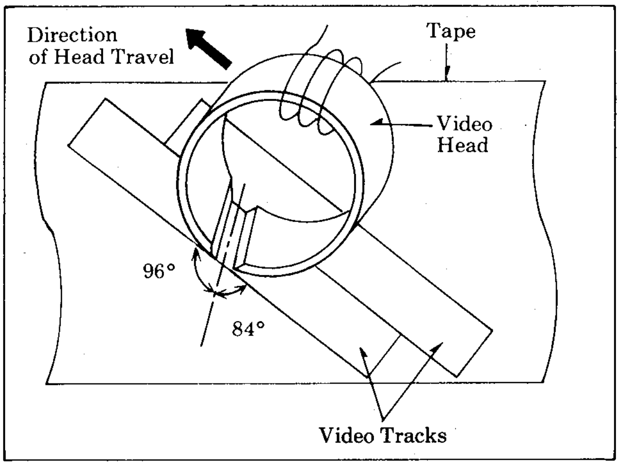
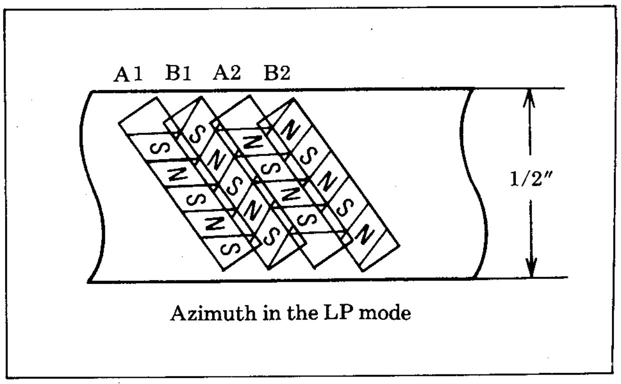


Fig. 11

These heads make the VHS format different from most other VTR formats. Exactly how the azimuths of ±6° helps to keep out adjacent track interference is explained next.

3. **AZIMUTH RECORDING**

Azimuth Recording is used in VHS to eliminate the interference or crosstalk picked up by a video head. Again, because adjacent video tracks touch, or crosstalk, a video head when scanning a track will pick up some information from the adjacent track. The azimuths of the head gaps assure that video head "A" will only give an output when scanning across a track made by head "A". Head "B", therefore, only gives an output when scanning across a track made by head "B". Because of the azimuth effect, a particular video head will not pick up any crosstalk from an adjacent track. Let's examine this more closely.
In Fig. 12, we can see the VHS/LP video tracks with not to scale North and South magnetized regions in them.



Azimuth in the LP mode

Fig. 12

It can also be seen that these N or S regions are not perpendicular to the track, they have −6° azimuth in tracks A1, A2; and +6° azimuth in tracks B1, B2.
If we take track A1 and darken the N regions, it becomes easier to see.

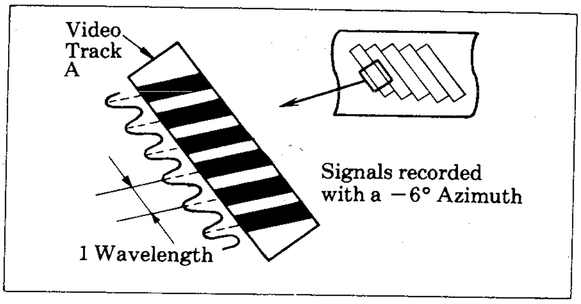


Fig. 13

In Fig. 14, we see the information on track A, made by head "A". Imagine now that head "A" is going to playback this track, by superimposing the head over the track. Clearly, the gap fits exactly over the N and S regions, so that at any moment there is either an N region or an S region or an N to S (or S to N) transition across the gap. This produces maximum output in head "A". Now, visually superimpose the "B" head over the track.

Here there are N and S regions across the gap at the same time, at any given moment. Remember that simultaneous N and S regions across the gap cause cancellation, and therefore no output. Looking at Fig. 14, we can see that the gap width is equal to 1/2 the recorded wavelength. Recall that this occurs at the highest frequency which is to be recorded.

So therefore, the azimuth effect works at these high frequencies.

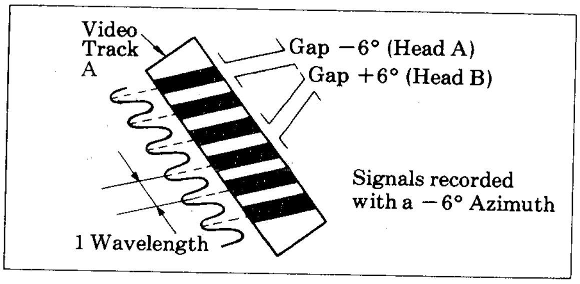


Fig. 14

But what happens at lower frequencies? In Fig. 15, we see a diagram similar to Fig. 14, except the recorded wavelength is longer, which represents a lower frequency.

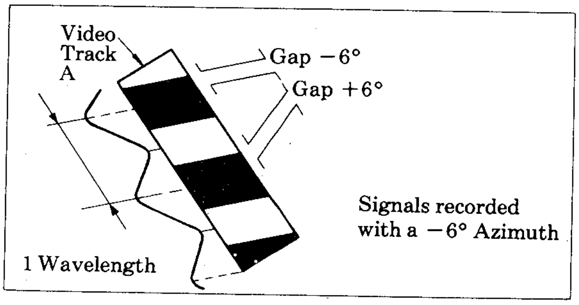


Fig. 15

Again, visually superimpose the heads over the track. Head "A" is the same as before. But look at head "B". There is much less cancellation across the gap, and its output is close to that of head "A". Therefore, we see where the azimuth effect is dependent on frequency. The higher the frequency, the better the azimuth effect. The lower the frequency, the lower the separation by azimuth effect.

The azimuth effect, then, can be used for the high frequency FM or luminance portion of the signal to be recorded, but in the frequency region of the converted subcarrier, a new method is used to eliminate adjacent track crosstalk.

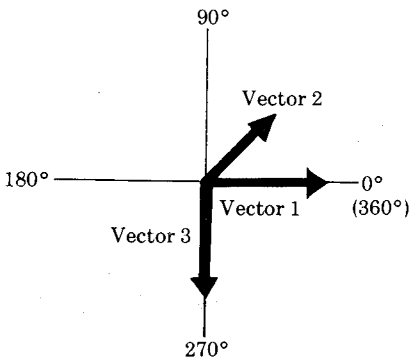
4. VHS COLOR RECORDING SYSTEM

Because there is insignificant azimuth effect at lower frequencies, a new color recording system must be adopted.

The fact that crosstalk occurs at lower frequencies cannot be changed, this happens right at the tape during playback. The method adopted processes the crosstalk component signals from the heads so that they are eliminated. It is important to realize that the crosstalk DOES STILL OCCUR. It is the recording/playback circuitry that performs the elimination.

In ordinary Helical VTR's using converted subcarrier direct recording, the phase of the chrominance signal is untouched, recorded directly onto the tape. The chrominance signal and its phase can be represented by vectors. Vectors graphically represent the amplitude and phase of ONE frequency. In this discussion, we will consider (for simplicity) the chrominance signal to be of one frequency. As an example of vectors, see Fig. 16.

The length any vector represents its amplitude.



Vector 1 has a phase angle of 0°
Vector 2 has a phase angle of 45°
Vector 3 has a phase angle of 270°

Fig. 16

We know that the azimuth effect will not work at the lower frequencies. And since the color information in VHS is recorded at low-converted frequencies, a new method of color recording was adopted.

Vector Rotation in Recording is actually a phase shift process that occurs at a horizontal rate, 15,734Hz.

The chrominance signal can be represented by a vector, showing amplitude and phase. (↑)

In ordinary Helical Scan VTR's the vector is of the same phase for every horizontal line, on every track as shown in Fig. 17.

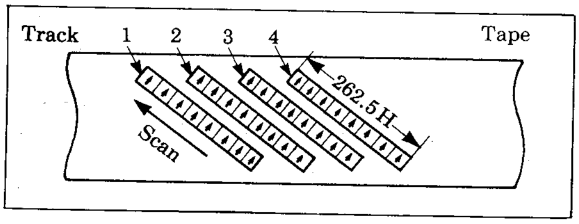


Fig. 17

In VHS, we still convert the 3.58MHz down to a lower frequency, namely 629kHz, but the new color method used in VHS format is a process of vector rotation. During recording the CHROMINANCE phase of each horizontal line is shifted by 90°. For head "A" (CHANNEL 1) we ADVANCE the CHROMINANCE phase by 90° per horizontal line (H).
For head "B" (CHANNEL 2) we DELAY the chrominance phase 90° per H.
VECTOR (PHASE) ROTATION:
CHANNEL 1 +90°/H
CHANNEL 2 −90°/H
Fig. 18 shows what this looks like on tape for VHS/LP.

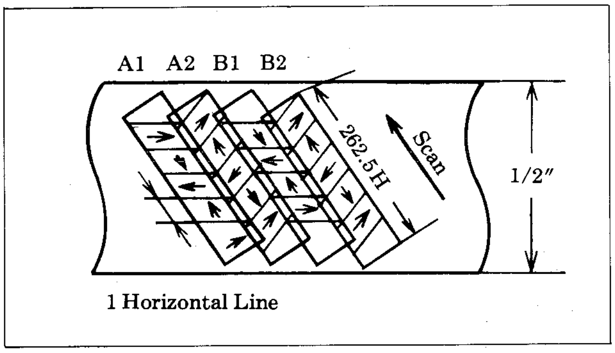


Fig. 18

Now assume that head "A" plays back over track A1 it will produce a vector output as such:

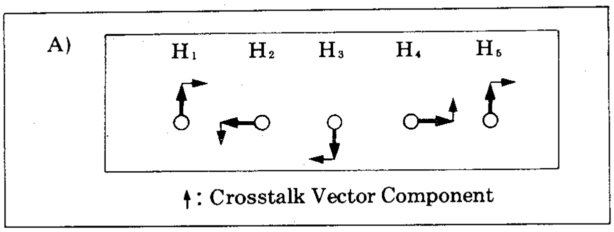


Fig. 19

Head "A" when tracking over A1 will have an output consisting of the main signal (large vectors) and some crosstalk components (small vectors).
Fig. 20, then is a vector representation of the playback chrominance signal from the head.
One of the most important things done in the playback process is the restoration of the vectors to their original phase. This is done by applying the same vector rotation process that was used in the recording.

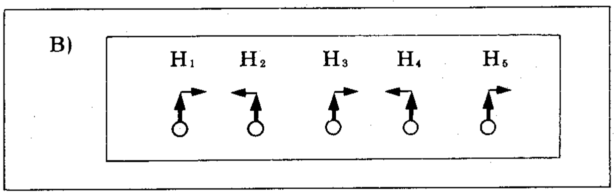


Fig. 20

This restored signal is then split 2 ways. One path goes to one input of an adder. The other path goes to a delay line which delays the signal by 1H. The output of the delay line goes to the other input of the adder. Fig. 21 explains.
As can be seen in Fig. 22, the crosstalk component has been eliminated after the first H line. We have now a chrominance signal free of adjacent channel crosstalk.

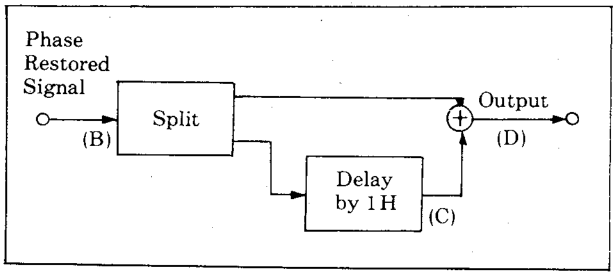


Fig. 21

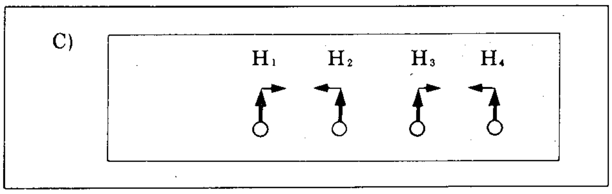


Fig. 22

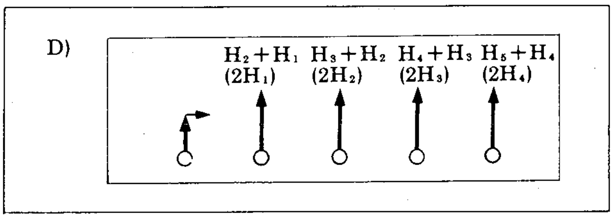


Fig. 23

The double output in Fig. 23 is not a problem because it can always be reduced. The process of adding a delayed line to an undelayed line is permissable because any 2 adjacent lines in a field contain nearly the same chrominance information.
So, if 2 adjacent lines are added, the net result will produce no distortion in the playback picture.
In conjunction with the crosstalk elimination is the re-conversion of the chrominance 629kHz to its original 3.58MHz. Now the color signal is totally restored.
This vector rotation recording method is also used in the SP mode.

5. THE RECORDED SIGNAL

SP MODE

Video signals, as stated before contain frequencies between DC and about 4MHz.
In converted subcarrier direct recording, the luminance and chrominance portions of the signal are separated.
This process of separation reduces somewhat the frequency range of the luminance and chrominance signals. Since the VHS/SP color system is a form of converted subcarrier direct recording, it too encounters this effect. The frequency ranges of the separated luminance and chrominance signals can be shown. See Fig. 24.
When the luminance signal is FM modulated, it produces an FM signal which occupies a new area in the spectrum.
It was explained before that the instantaneous level of the video signal sets the instantaneous frequency of the FM carrier.
In VHS/SP the lowest level of the video signal, sync tip, sets the FM carrier to 3.4MHz. Peak white portions of the video signal set the FM carrier to 4.4MHz. Carrier deviation is therefore from 3.4 to 4.4MHz. When generating an FM signal, sidebands are also produced. These sidebands lie above the 4.4MHz carrier swing and below the 3.4MHz carrier swing. See Fig. 25.

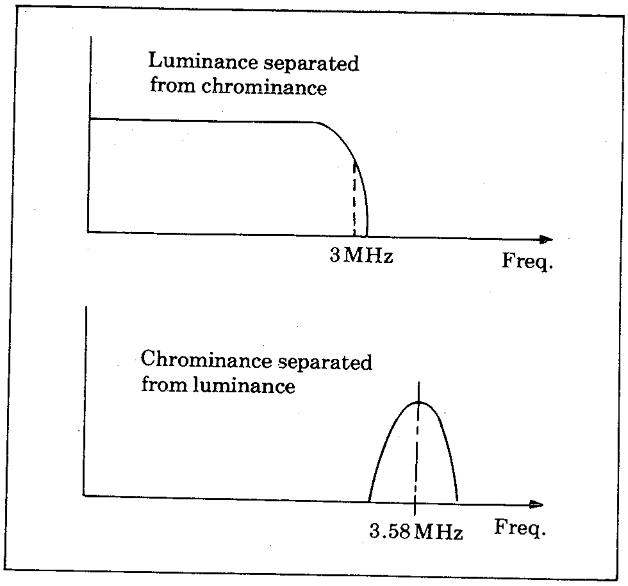


Fig. 24

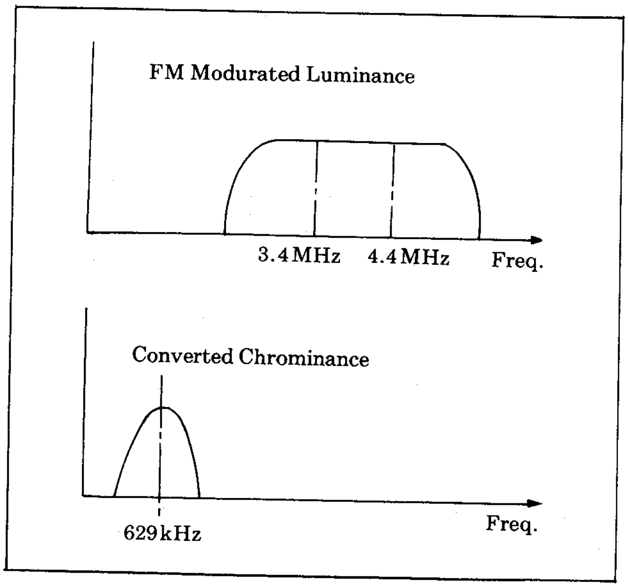


Fig. 25

When the chrominance signal is converted down to 629kHz it will lie below the lower sidebands of the FM modulated luminance signal. See Fig. 25.

The FM and converted chrominance signals are mixed before being recorded. The actual signal that is applied to the tape is shown in Fig. 26.

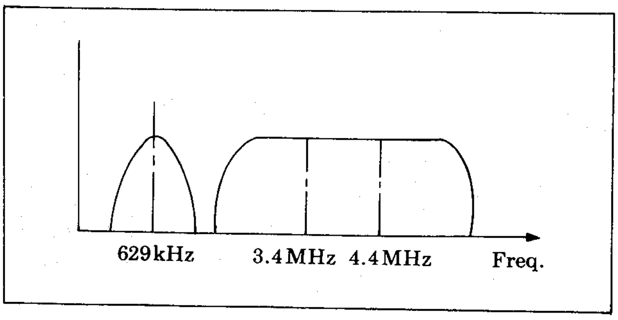


Fig. 26

LP MODE

The recorded signal in the LP Mode is considerably different from that used in the SP Mode.

Like the SP Mode, the chrominance and luminance signals are separated as shown in Fig. 24.

But from here on, things are treated differently. Let's examine again the video tracks on the tape of an LP recording.

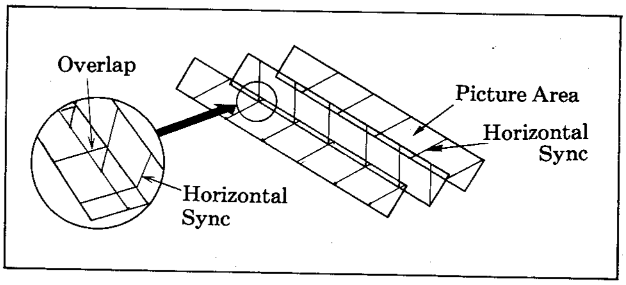


Fig. 27

Notice in Fig. 27 that the tracks do overlap, and that any picture area of any track does not line up perfectly with the picture area of the adjacent tracks. (No horizontal sync alignment.).

Let's pull several horizontal line segments off of the track for greater detail.

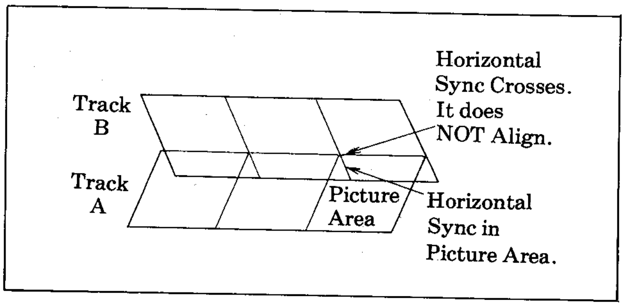

Track B
Track A
Horizontal Sync Crosses. It does NOT Align.
Picture Area
Horizontal Sync in Picture Area.

Fig. 28

As can be seen in Fig. 28, the horizontal sync portion of track B lies somewhere in the picture area of track A, for any given horizontal line segment.

Assume that track A was recorded first. Then, as track B is laid down, the 3.4MHz Horizontal Sync. section of "A" will produce a beat with the portion of track B that covers it. Although the entire overlapping region will produce beats, the beat caused by the Horizontal Sync is most noticeable because the sync tip FM frequency never changes, whereas the FM frequency for the picture portion is constantly changing.

This beat is visible on the screen, so measures must be taken to eliminate it. The method employed is called FM Interleaving Recording.

Note that beats are not the same as adjacent track crosstalk. Azimuth recording prohibits crosstalk pickup. But, the beat produced is a new frequency, it was not present in the video signal, it is the result of laying one track over another. The beat signal has no true azimuth, therefore, it will be detected by both video heads.

The FM Interleaving Recording Method does not actually eliminate the beat, but rather places it at such a frequency so that no beat can be detected on the screen.

It is a fact in the NTSC Color Television System that video frequencies which are an odd multiple of 1/2 the horizontal line frequency (of 15,734Hz) have the property called "interleaving". Interleaving signals appear on the TV screen in a rather special way. Between any 2 adjacent lines, the signals are out of phase, as shown in Fig. 29 by the solid lines:

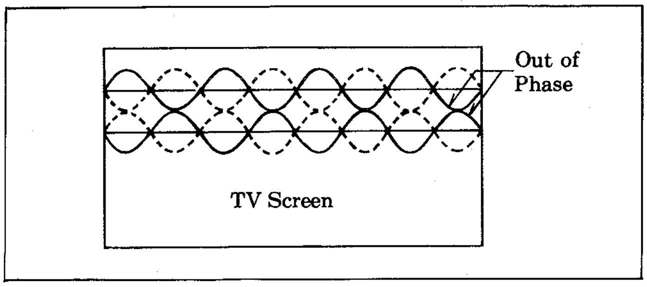


Fig. 29

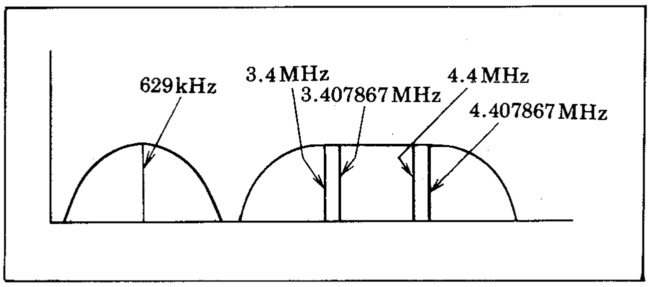


Fig. 30

Because the 2 lines are very close, the human eye tends to integrate them. The out-of-phase signals will virtually be cancelled, undiscernable by the viewer.

Now, when the frame is completed and the next frame begins, the signal on the top line will be out of phase with what was previously scanned. This is shown by the dotted line. This will cancel any phosphor persistance from the previous scan. Thus, interleaved frequencies, for all purposes, do not create interference on the TV screen.

This interleaving is accomplished by raising the sync tip FM frequency in Channel 1 by 15734/2MHz (7867Hz).

For Channel 1, then, sync tip FM frequency is 3.407867MHz and peak white becomes 4.407867MHz.

Channel 2 remains the same as before, sync tip is 3.4MHz, and peak white is 4.4MHz.

This displacement by 7.867kHz causes the beat produced by the overlapped horizontal sync to become an interleaving frequency, which solves the problem.

Recovery of this shifted FM signal, although somewhat different, is essentially the same as before.

The Chrominance and FM signals which are mixed and applied to the tape occupy a spectrum as shown in Fig. 32.

6. TAPE LOADING

In VHS, the tape path out of the cassette, across the stationary heads and around the video head cylinder forms a letter "M", thus the name "M" Loading. See Fig. 31.

The M loading has several advantages over previous, more complex loading formats.

1) Less tape is pulled out from the cassette. This reduces the chances of tape spillage and tangles.
2) Because the tape path in the M load pattern is short, loading time is only 3 seconds, including video muting.
3) FF and REW are performed INSIDE the cassette, further reducing the chances of tape damage.

7. SAFETY FEATURES

The M loading format incorporates many safety features to guard against accidental damage to the tape. If any of the mechanical failures listed below occurs, the recorder will go into the stop mode.

1) If loading takes longer than 5 sconds.
2) If take up fails to start after 3 seconds.
3) If take up fails during Record or Playback.
4) If the head cylinder fails to start.
5) If ANY belt breaks.
6) If the auto-stop lamp burns out.

The video tape in the cassette is worth protecting, so if any of these potentially dangerous failures occurs while the unit is recording or playing back, it will automatically stop.

It cannot be operated again until the problem is solved.

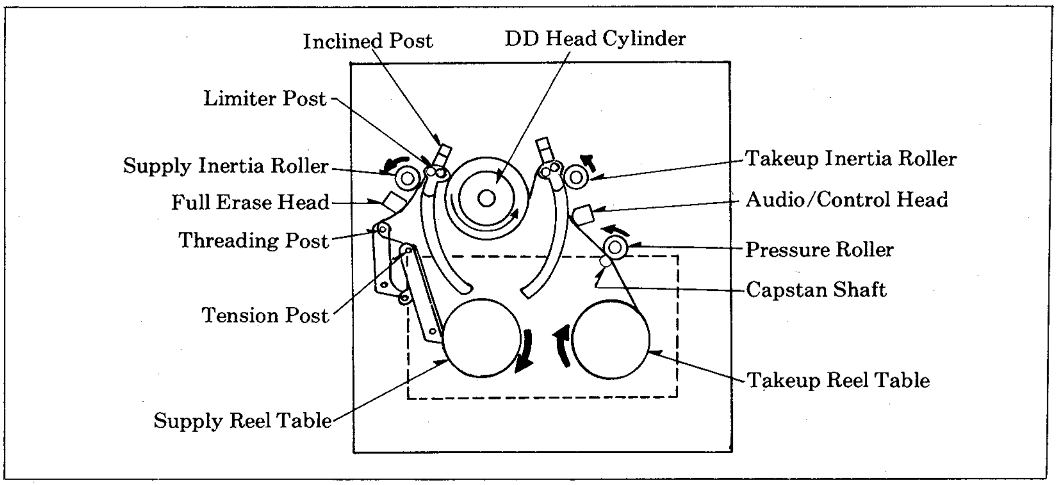


Fig. 31

GLOSSARY

ACC

Automatic Color Control used to maintain an overall constant color signal level in the color circuits.

ACK

Automatic Color Killer.

Adjacent Track

This is the name of the video track to the immediate left or right of the track of concern.

AFC

Automatic Frequency Control used to phase-lock the color circuits to either the recording or playback color signal, in order to achieve a stable color signal.

AFT

Automatic Fine Tuning...This is a special circuit found in most recent TV sets which makes the local oscillator of the TV tuner follow the channel of concern in order to produce a stable IF frequency. In other words, if for any reason the TV station being received changes frequency, the AFT circuit will automatically compensate so that no interference will be seen on the screen, i.e., no manual fine tuning is necessary.

AGC

Automatic Gain Control used to maintain an overall constant picture level in the luminance circuits.

APC

Automatic Phase Control used to help phase lock the color circuits to either the recording or playback color signal in order to achieve a stable color signal.

Azimuth

A term used to describe the left to right tilt of the gap of a recording head, if it could be viewed straight on.

Balanced Modulator

A circuit so designed to give as an output the frequency sum or frequency difference of its two input signals. Any special characteristics of one of the input signals will be present in the output signal.

Beats

A term used to describe the unwanted signals produced when two original signals are allowed to be mixed together.

Bipolar PG

Pulse Generator signals that have both positive and negative excursions.

Burst

A short time occurence (8 to 10 cycles) of the 3.58MHz subcarrier signal, appearing right after horizontal sync but centered on the blanking portion of the video waveform. Burst is used to keep the color oscillator of a TV receiver locked to the broadcast station.

B/W

Abbreviation for Black and White.

C

Capacitor.

C Signal

The color portion of a video signal.

Capstan

A small rotating metal dowel which drives the recording tape to assure positive tape movement.

Chroma

The color portion of a video signal.

Chrominance

The color portion of a video signal.

Clamp

The process of giving an AC signal a specific DC level.

Control Signal

A special signal recorded onto the video tape which is used during playback as a reference for the servo circuits.

Converted Subcarrier

This is the process of frequency shifting the color 3.58MHz subcarrier and its sidebands down to 629kHz.

Crosstalk

The name given to the unwanted signals obtained when a video head picks up information from an adjacent track.

D

Diode.

DL

Delay Line.

DDC

Direct Drive Cylinder...as used in VHS, this means that the video heads are driven by a self-contained brushless DC motor using no belts or gears. DD cylinders produce pictures with better stability.

Dark Clip

After emphasis, the negative going spikes (undershoot) of a video signal may be too large in amplitude for safe FM modulation. A dark clip circuit is used to cut off these spikes at an adjustable level.

Delta Factor (Δf)

A term used to indicate that a playback signal off the video tape has some jitter or "wow and flutter". Δf, or "a change in frequency" means that the color signal off the tape is not a stable frequency of 629kHz, but rather a signal whose frequency at any instant is some small amount above or below 629kHz.

Deviation

A term used to describe how far the FM carrier swings when it is modulated. In VHS the upper limit is 4.4MHz.

Dew Detector

A variable resistor whose resistance value depends upon the ambient humidity.

Dihedral

A term used to describe the relative position between the two video heads as they are mounted in the head cylinder. Perfect dihedral means that the tips of the heads are exactly 180° apart.

Dropout

A momentary absence of FM or color signal off the tape, whether due to uneven oxide or a coating of dust on the tape or video heads.

Duty Cycle

In describing a rectangular waveform, the "duty" refers to the percentage of off time and on time for one complete cycle. 50—50 means that there are equal periods of off time and on time for one cycle and this would be a square wave.

E-E

Electronics to Electronics...this is the picture viewed on the TV set when a recording is being made. This picture goes through some but not all of the circuits of the recorder and is used to test the operation of said circuits.

EQ

Shortened form of "Equalization", used in the audio circuits.

Emphasis

The process of boosting the level of the high frequency portions of the video signal.

FG

Frequency Generator used in the servo circuits.

FL

Filter.

FM Signal

The luminance portion of the video signal is used to control the frequency of an stable multivibrator. The output of this multivibrator is a frequency modulated (FM) signal shifting from 3.4MHz to 4.4MHz (plus sidebands).

Field

One half of a television picture. A field consists of 262.5 horizontal scanning lines across the picture tube. Two fields are necessary to complete a fully scanned TV picture (frame). First, one field is "sprayed" on the picture tube, starting at the top of the tube with Line 1, and ending at the bottom with Line 262.5.

Then, the next field begins at the top of the tube again with Line 262.5 and ends at the bottom with Line 525. The lines of the second field lie in-between the lines of the first field. This property of falling in-between lines is called "interlacing". The two sweeps of the picture tube, or two fields make up one complete TV picture or "frame". Frame repetition is 30Hz, therefore field repetition is 60Hz.

Flagwaving

This is the term used to describe a TV sets ability to accept unstable playback pictures from a video tape recorder. All home VTR's have some degree of playback instability. A TV set with a long horizontal AFC time constant may not recover from the VTR's instability before the active picture is being scanned. This can cause a bending or flapping from side to side of the top inch or so of the screen. This movement is called "flagwaving".

Frame

One complete TV picture. See "Field".

Gate

A circuit which will deliver an output only when a specific combination of its inputs are present. For use in analog or digital applications.

Guard Band

This is the space between video tracks on the video tape in the SP mode. Guard bands contain no information.

HD

Horizontal Drive signal.

Head Cylinder

A cylindrical piece of metal which houses the video heads. The tips of the heads protrude slightly from the surface of the cylinder so that they may scan the tape as the cylinder spins.

Head Switching

The action of turning off during playback, the video head which is not in contact with the video tape. A particular video head will be turned off 30 times per second. This is done so that the head which is not scanning the tape, and therefore not delivering a good signal, cannot contribute any noise to the playback signal.

Head Switching Pulse

The signal which is applied to the Head Amplifier to perform head switching. This is a square wave at 30Hz, with a 50—50 duty cycle.

Helical

A word used to describe a general type of VTR in which the tape wraps around the video head cylinder in the shape of a 3-dimensional spiral, or "helix". The video tracks are recorded as a series of slanted lines.

IC

Integrated Circuit.

Interchangeability

A term used to describe how well a particular VTR will paly back a tape recorded on another VTR of the same type. Good interchangeability indicates good playback.

Interlacing

The property of the scan lines of two television fields to lie in-between each other. See "Field".

Interleaving

A term used to indicate that the harmonics of the chrominance signal lie in-between the harmonics of the luminance portion of the video signal as it is viewed on a spectrum analyzer. This means that the color information of a video signal does not interfere with, although it is broadcast at the same time as, the luminance information.

Also, signals which have this interleaving property are not readily seen on a TV screen, because of their virtual cancellation characteristics.

Interleaving signals (fi) must have the following frequency relationship:

$$fi=(\frac{2n+1}{2})\times 15{,}734\,(n=0,\ 1,\ 2,\ 3,\ 4......)$$

Jitter

The name of the effect on the playback picture if a VTR has too much "wow and flutter". The picture appears to have a rapid shaking movement.

L

Coil.

Luminance

This is the portion of video signal which contains the sync and B/W information.

MMV

Monostable Multi-Vibrator...Usually an IC device which gives a logic high or low output with a variable duration upon receipt of an input pulse or transition.

Non-Linear Emphasis

This is similar to regular emphasis with the difference that small level high frequency portions of the signal are given more of a boost than higher level high frequency portions.

NTSC

The National Television Systems Committee. These four letters identify the United States color television standard.

PG

Pulse Generator used in the servo circuits.

Q

A term used to describe the graphic response of a filter or tuned amplifier.

R

Resistor.

RF

Radio Frequencies.

Rotary Chroma

The name of the process used in VHS to change the phase of the chrominance signal at a rate of 15,734 (same as H sync frequency) times per second.

Rotary Transformer

A device used to magnetically couple RF signals to and from the spinning video heads, thus eliminating the need for brushes.

Sample and Hold

A process used in comparator circuits by which the value of a particular signal is measured at a specific moment in time...then this value is stored for later use.

Servo

Short for Servomechanism. This is an electro-mechanical device whose mechanical operation (for instance motor speed) is constantly being measured and regulated so that it closely matches or follows an external reference.

Skew

Another way of saying Tension Error. Skew is actually the change of size or shape of the video tracks on the tape from the time of recording to the time of playback. This can occur as a result of poor tension regulation by the VTR, or by ambient conditions which affect the tape.

Subcarrier

The name of the 3.58MHz continuous wave signal used to carry color information.

T

Transformer.

TP

Test Point.

TR

Transistor.

Tension Error

See "Skew".

Time Base Stability

A term used to describe how closely the playback video signal from a VTR matches an external reference video signal...in regard to sync timing rather than picture content.

Tracking

This is the action of the spinning video heads during playback when they accurately track across the video RF information laid down during recording. Good tracking indicates that the heads are positioning themselves correctly, and are picking up a strong RF signal. Poor tracking indicates that the heads are off track, and picking up low level RF signal or noise.

VCO

Voltage Controlled Oscillator...An oscillator whose frequency of oscillation is governed by an external voltage.

Video Head

This is the electro-magnet used to develop magnetic flux which will put RF information on the tape. In VHS, two video heads are mounted in a rotating cylinder around which the video tape is wrapped. As the cylinder spins, each video head is allowed to alternately scan the tape.

Video Track

The name of the RF information laid down during recording, as a particular video head scans across the tape.

VHS

Video Home Systems.

VTR

Video Tape Recorder.

VV

Video to Video...or...the actual playback picture produced from a tape during playback.

VXO

Voltage Controlled Crystal Oscillator...Similar to VCO except that a quartz crystal is used as a reference which can be varied.

White Clip

After emphasis, the positive going spikes (overshoot) of the video signal may be too large for safe FM modulation. A white clip circuit is used to cut off these spikes at an adjustable level.

XTAL

Abbreviation for crystal.

Y Signal

The B/W portion of a video signal containing B/W information and sync.

ORDER NO. VRD-8303-369

Service Manual

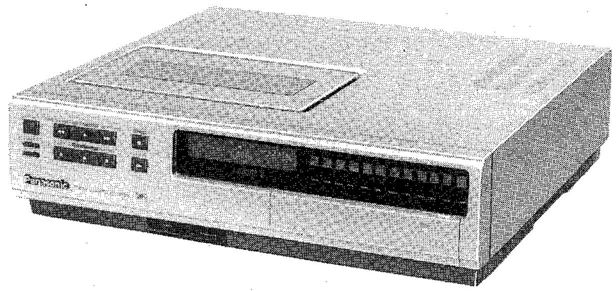
Video Cassette Recorder

Panasonic
Omnivision VHS

PV-1220

Vol. 1

Summary
Technical Descriptions



SPECIFICATIONS

Power Source: 120V AC ±10%, 60Hz ±0.5%
Power Consumption: Approx. 21 watts
Television System: EIA Standard (525 lines, 60 fields)
NTSC color signal
Video Recording System: 2 rotary heads, helical scanning system
Luminance: FM azimuth recording
Color signal: Converted subcarrier phase shift recording
Audio Track: 1 track
Tape Format: Tape-width 1/2″ (12.7mm), high density tape
Tape Speed: SP mode: 1-5/16 i.p.s. (33.35mm/s)
LP mode: 21/32 i.p.s. (16.67mm/s)
SLP mode: 7/16 i.p.s. (11.12mm/s)
Record/Playback Time: 8 HRS. with 160 min. type tape used in SLP mode
FF/REW Time: Less than 6 min. with 120 min. type tape
Heads: Video: 2 rotary heads
Audio/Control: 1 stationary head
Erase: 1 full track erase
1 audio track erase
Input Level: Video: VIDEO IN Jack (RCA type)
1.0Vp-p, 75Ω unbalanced
Audio: AUDIO IN Jack (RCA type)
−20dB, 100kΩ unbalanced
TV Tuners: VHF Input: VHF Ch2-Ch13, 75Ω unbalanced
UHF Input: Ch14-Ch83, 300Ω balanced
Output Level: Video: VIDEO OUT Jack (RCA type)
1.0Vp-p, 75Ω unbalanced
Audio: AUDIO OUT Jack (RCA type)
−6dB, 600Ω unbalanced
RF Modulated: Ch3/Ch4 switchable, 72dBμ, (Open Voltage)
75Ω unbalanced

Video Horizontal Resolution: Color: more than 230 lines
B/W: more than 230 lines
Audio Frequency Response: SP mode: 100Hz ~ 8kHz
(10dB down) LP mode: 100Hz ~ 6kHz
SLP mode: 150Hz ~ 5kHz
Signal-to-Noise Ratio: Video: SP mode: better than 40dB
LP mode: better than 40dB
SLP mode: better than 40dB
(Rohde & Schwarz noise meter)
Audio: SP mode: better than 42dB
LP mode: better than 40dB
SLP mode: better than 40dB
Operation Temperature: 41°F—104°F (5°C—40°C)
Operating Humidity: 10%—75%
Weight: 17.6 lbs. (8.0kg)
Dimensions: 16-15/16″(W) × 14-3/8″(D) × 4-1/2″(H)
(430mm × 365mm × 115mm)
Accessories Supplied:
- Remote control unit
- VHF matching box 75Ω—300Ω transformer
- 300Ω—75Ω transformer
- Coaxial cable with one-touch type F Connector
- Twin-lead cable

Available Tapes: 1/2″ VHS video cassette tapes
NV-T160 Approx. 1073ft. (327m), 160, 320, or 480 min
NV-T120 Approx. 810ft. (247m), 120, 240, or 360 min
NV-T60 Approx. 417ft. (127m), 60, 120, or 180 min.

Weight and dimensions shown are approximate. Specifications are subject to change without notice.

Panasonic®

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INTRODUCTION

This Service Manual contains information which will allow the service technician to understand and service the Panasonic VHS Recorder Model PV-1220 and the various accessories that compliment the deck. For a detailed technical explanation, please refer to the Training Manual on this model.

Some of the Features incorporated in this model are: soft touch controls, 12 position Electronic Tuner, 2 week/1 program Timer, 4 function Wired Remote Control, One Touch Record Button (OTR), Picture Search in SP, LP, and SLP, STILL Picture in SLP, Light Editing, and Auto Rewind.

The PV-1220 also uses a new multi function display indicator.

This display tube combines indicators for time, tape counter, speed, transport functions, and timer record into one easy to read digital display.

The above features plus the VHS format make the PV-1220 table top VCR an excellent unit for your enjoyment.

Just slightly ahead of our time...Panasonic.

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SAFETY PRECAUTIONS 1-1
CONTROLS & COMPONENTS 1-2
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    2. Azimuth Recording 1-7
    3. VHS Color Recording System 1-8
GLOSSARY OF TERMS 1-10

SAFETY PRECAUTIONS

GENERAL GUIDELINES

1. When servicing, observe the original lead dress. If a short circuit is found, replace all parts which have been overheated or damaged by the short circuit.
2. After servicing, see to it that all the protective devices such as insulation barriers, insulation papers shileds are properly installed.
3. After servicing, make the following leakage current checks to prevent the customer from being exposed to shock hazards.

LEAKAGE CURRENT COLD CHECK

1. Unplug the AC cord and connect a jumper between the two prongs on the plug.
2. Measure the resistance value, with an ohmmeter, between the jumpered AC plug and each exposed metallic cabinet part on the equipment such as screwheads, connectors, control shafts, etc. When the exposed metallic part has a return path to the chassis, the reading should be between 1 MΩ and 5.2 MΩ.
   When the exposed metal does not have a return path to the chassis, the reading must be ∞.

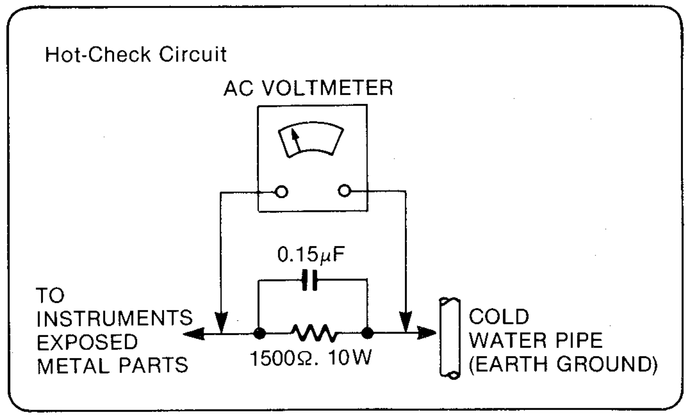


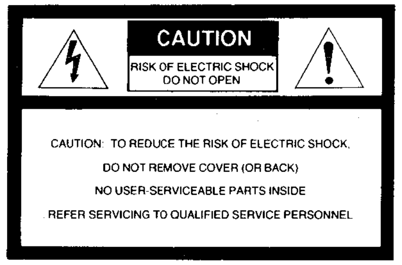
Figure 1

LEAKAGE CURRENT HOT CHECK (See figure 1.)

1. Plug the AC cord directly into the AC outlet. Do not use an isolation transformer for this check.
2. Connect a 1.5kΩ, 10 watts resistor, in parallel with a 0.15μF capacitor, between each exposed metallic part on the set and a good earth ground such as a water pipe, as shown in figure 1.
3. Use an AC voltmeter, with 1000 ohms/volt or more sensitivity, to measure the potential across the resistor.
4. Check each exposed metallic part, and measure the voltage at each point.
5. Reverse the AC plug in the AC outlet and repeat each of the above measurements.
6. The potential at any point should not exceed 0.75 volts RMS. A leakage current tester (Simpson Model 229 equivalent) may be used to make the hot checks, leakage current must not exceed 1/2 milliamp. In case a measurement is outside of the limits specified, there is a possibility of a shock hazard, and the equipment should be repaired and rechecked before it is returned to the customer.

FEATURES

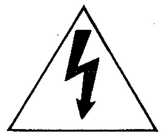
- **Eight-hour recording**
- **Multi-motion playback**
  - Search
  - Still
  - Frame Advance
  - Slow
- **Fine-editing function**
- **Watch one channel while recording another**
- **Unattended Recording**
  (Timer Recording)
- **One Touch Recording**
- **Remote Control**



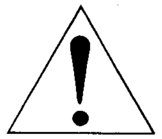
CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK)
NO USER-SERVICEABLE PARTS INSIDE
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL

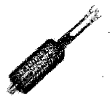
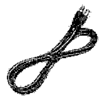
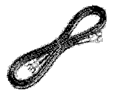
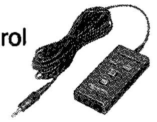


This symbol warns the user that uninsulated voltage within the unit may have sufficient magnitude to cause electric shock. Therefore, it is dangerous to make any kind of contact with any inside part of this unit.



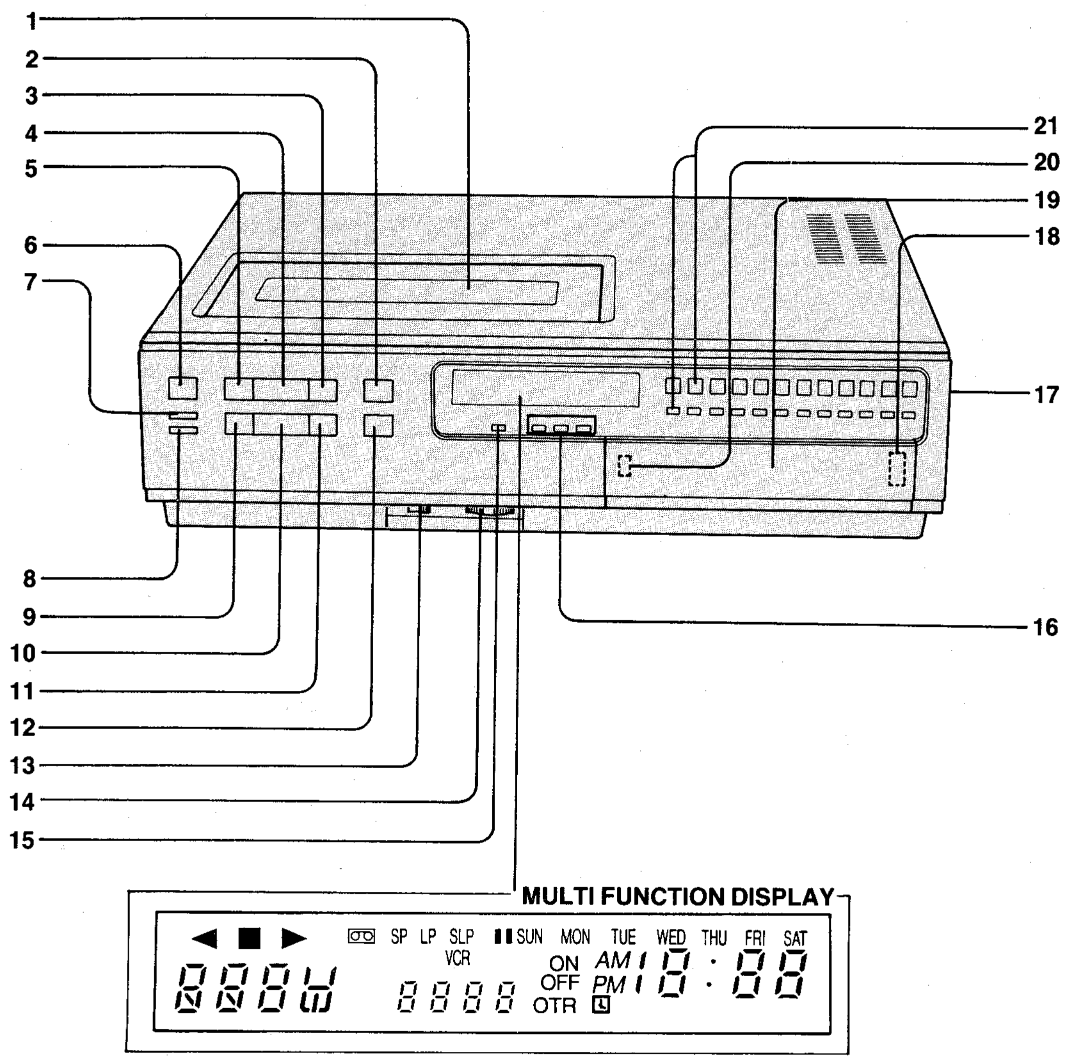
This symbol alerts the user that important literature concerning the operation and maintenance of this unit has been included.
Therefore, it should be read carefully in order to avoid any problems.

ACCESSORIES SUPPLIED

1 pc. VHF Matching box 75 ohm – 300 ohm transformer 	1 pc. 300 ohm – 75 ohm Transformer 	1 pc. Coaxial Cable with one-touch type F connector 
1 pc. Twin-Lead Cable 	1 pc. Remote Control 	

CONTROLS AND COMPONENTS

TOP and FRONT



MULTI FUNCTION DISPLAY

- **DIGITAL CLOCK**
  Normally, the present time is displayed.
- **TAPE COUNTER**
  Tape counter number is displayed.
- **SPEED INDICATOR "SP" "LP" "SLP"**
  This shows the tape speed during recording and playback.
- **VCR/TV INDICATOR "VCR"**
  This indicator appears when the VCR/TV Selector is set to VCR.
- **FUNCTION INDICATOR "◄■► 8888 "**
  This shows the mode of VCR (EJECT, PLAY, REC, REW, FF, PAUSE, STILL, SEARCH, STOP, FRAME ADVANCE).
- **DEW INDICATOR " dEW "**
  This indicator appears if excessive moisture condenses in the unit. If the DEW Indicator is ON, the unit will not operate. If this happens, leave the VCR ON and let it remain at room temperature until this indicator goes off.
- **TIMER INDICATOR " ◷ "**
  When TIMER Button is set to ON, this indicator appears and you will not be able to operate the unit manually.
- **O.T.R. INDICATOR "OTR"**
  When OTR is set, this indicator appears.
- **CASSETTE-IN INDICATOR " ▭ "**
  This indicator shows the condition of the cassette tape in the unit.

1. **CASSETTE HOLDER**

2. **RECORD BUTTON**
   Recording is started by pushing this button and the PLAY Button at the same time. "REC" and " ► " appear on the Multi Function Display.

3. **FAST FORWARD/SEARCH ⏩ BUTTON**
   Push this button to move the tape forward rapidly. "FF" and " ► " appear on the Multi Function Display. During the playback mode, holding this button down will allow you to view the picture in the forward direction rapidly. " ► " flashes.

4. **PLAY BUTTON**
   Push this button to play back recorded tapes. "PLAY" and " ► " appear on the Multi Function Display.

5. **REWIND/SEARCH ⏪ BUTTON**
   Push this button to rewind tapes. "REW" and " ◄ " appear on the Multi Function Display. During the playback mode, holding this button down will allow you to view the picture in reverse rapidly. " ◄ " flashes.

6. **POWER BUTTON**
   This button is used to turn the VCR on and off. When this button is pushed, counter " 0000 " appears on the Multi Function Display.

7. **TIMER BUTTON**
   This button is used for Unattended Recording after programming functions have been completed. When this button is ON, " ◷ " appears on the Multi Function Display, and you will not be able to operate the unit manually.

8. **VCR/TV SELECTOR**
   VCR: To monitor video recordings or to view playback.
   TV: To watch TV or to view another program while recording a different program.
   When this is set to VCR, "VCR" appears on the Multi Function Display.

9. **EJECT BUTTON**
   Push this button to insert or remove the cassette. " ■ " flashes on the Multi Function Display while the tape is being ejected.

10. **STOP BUTTON**
    Push this button to stop the tape. " ■ " appears on the Multi Function Display.

11. **PAUSE/STILL BUTTON**
    Push this button to temporarily stop the tape movement in either the recording or playback mode. During playback, a still picture is produced when the pause is used. Push again to release pause. When this button is pushed, "PLAY" and " ■ " appear on the Multi Function Display.

12. **FRAME ADVANCE BUTTON**
    While viewing a still picture, push this button to advance the picture one frame at a time or hold it down for a slow-motion picture. When this button is pushed, "PLAY" and " ■ " appear and " ► " flashes on the Multi Function Display.

13. **TAPE-SPEED SELECTOR (SP/LP/SLP)**
    Set this selector depending upon the length of the program to be recorded.

14. **TRACKING CONTROL**
    Use this control during playback if the image is partially obscured by bands of noise. See page 17 for details.

15. **RESET BUTTON**
    By beginning the recording at "0000", subsequent playback will be more convenient.
    Pushing this button causes the Tape Counter to return to "0000".

16. **TIMER CONTROLS**
    Use this Timer to make an Unattended Recording when you are away from home, busy or asleep.

17. **CHANNEL NUMBER HOLDER**
    Pull it out for changing channel tabs.

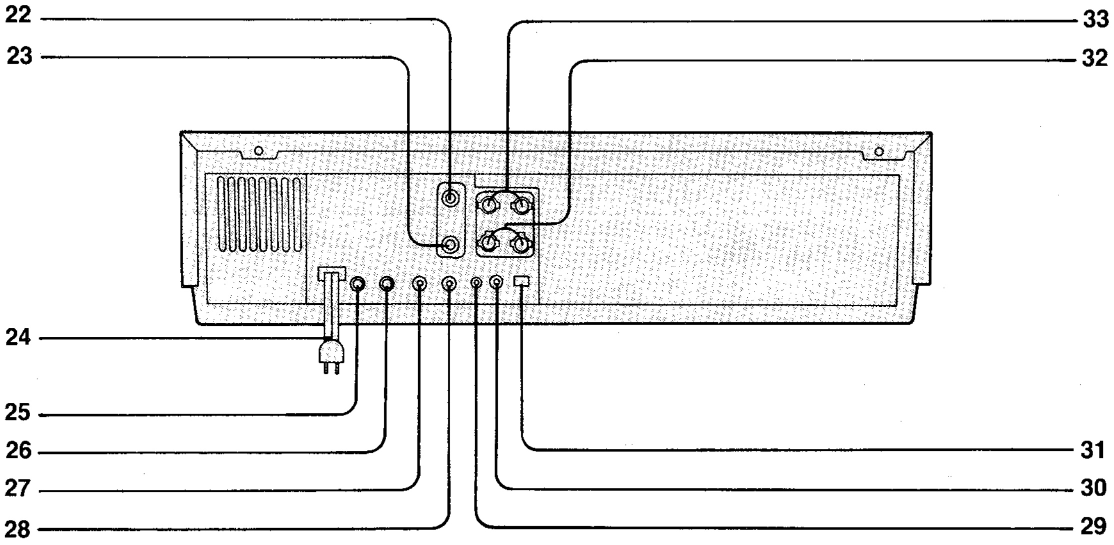
18. **AUTOMATIC FINE TUNING (AFT) SWITCH (INNER DOOR)**
    Under normal conditions, turn the AFT Switch "ON".

19. **UHF/VHF FINE TUNING CONTROLS (INNER DOOR)**

20. **ONE TOUCH RECORD (O.T.R.) BUTTON (INNER DOOR)**
    One Touch Recording enables you to do impromptu recordings at any time. Just select the channel and push the ONE TOUCH RECORD Button for 30 minutes to 2 hours of recording.

21. **CHANNEL SELECTOR BUTTONS/INDICATOR LIGHTS**
    Select the channel (2-83) you wish to view or record by pushing any one of these 12 buttons.

REAR



22. **VHF ANTENNA OUTPUT TERMINAL (TO TV SET)**
    Connect this terminal to the VHF antenna terminal on the TV.

23. **VHF ANTENNA INPUT TERMINAL (FROM ANTENNA)**
    Connect the VHF antenna to this terminal.

24. **AC POWER CORD**
    Connect to a 120 V 60 Hz AC outlet.

25. **VIDEO OUTPUT CONNECTOR**
    For connection to a monitor TV or another VCR.

26. **AUDIO OUTPUT CONNECTOR**
    For connection to a monitor TV, another VCR or an audio tape recorder.

27. **VIDEO INPUT CONNECTOR**
    For connection to another VCR or a portable video camera.

28. **AUDIO INPUT CONNECTOR**
    For connection to a portable video camera or another VCR.

29. **CAMERA REMOTE JACK**
    For connection to the Remote Pause Jack of the optional camera.

30. **REMOTE JACK**
    For connection to the Wired Remote Control.

31. **RF CONVERTER CHANNEL SELECTOR**
    Set to channel 3 or 4, whichever is not used in your area.

32. **UHF ANTENNA INPUT TERMINALS (FROM ANTENNA)**
    Connect the UHF antenna to these terminals.

33. **UHF ANTENNA OUTPUT TERMINALS (TO TV SET)**
    Connect these terminals to the UHF antenna terminals on the TV.

•Photographs and illustrations may be somewhat different from the product.

VHS-PRINCIPLE OF OPERATION

Basic Video Tape Recording

To understand the VHS format, it is wise to first review the basic principles of video tape recording.

Like audio tape recording, video information is stored on magnetic tape by means of a small electromagnet, or head. The two poles of the head are brought very close together but they do not touch. This creates magnetic flux to extend across the separation (gap), as shown: Fig. 1.

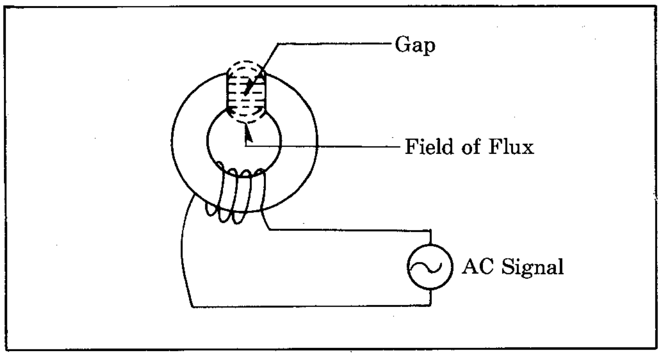


Fig. 1.

If an AC signal is applied to the coil of the head, the field of flux will expand and collapse according to the rise and fall of the AC signal. When the AC signal reverses polarity, the field of flux will be oriented in the opposite direction and will also expand and collapse. This changing field of flux is what accomplishes the magnetic recording. If this flux is brought near a magnetic material, it will become magnetized according to the intensity and orientation of the field of flux. The magnetic material used is oxide coated (magnetic) tape.

Using audio tape recording as an example, if the tape is not moved across the head, just one spot on the tape will be magnetized and will be continually re-magnetized. If the tape is moved across the tape, specific areas of the tape will be magnetized according to the field of flux at any specific moment. A length of recorded tape will therefore have on it areas of magnetization representing the direction and intensity of the field of flux. For instance:

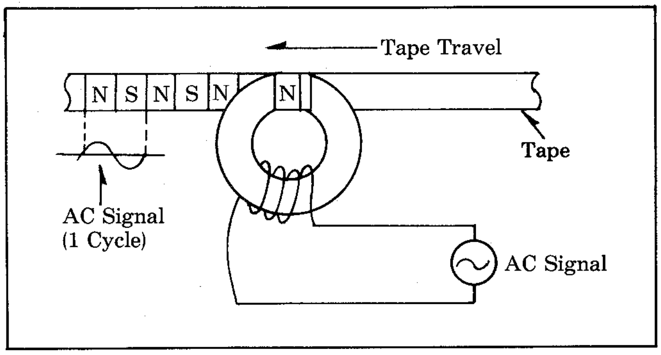


Fig. 2.

The tape will have differently magnetized regions, which can be called North (N) and South (S), according to the AC signal. When the polarity of the AC signal changes, so does the direction of magnetization on the tape, as shown by one cycle on the AC signal (see Fig. 2). If the recorded tape is then moved past a head whose coil is connected to an amplifier, the regions of magnetization on the tape will set up flux across the head gap which will in turn induce a voltage in the coil to be amplified. The output of the amplifier, then is the same as the original AC signal. This is essentially what is done in audio recording, with other methods for improvement like bias and equalization.

There are some inherent limitations in the tape recording process which do effect video tape recording, so they will be examined now. As shown in Fig. 2, The tape has North and South magnetic fields which change according to the polarity of the AC signal. What if the frequency of the AC signal were to greatly increase?

If the speed of the tape past the head (head to tape speed) is kept the same, the changing polarity of the high frequency AC signal would not be faithfully recorded on the tape, as shown in Fig. 3.

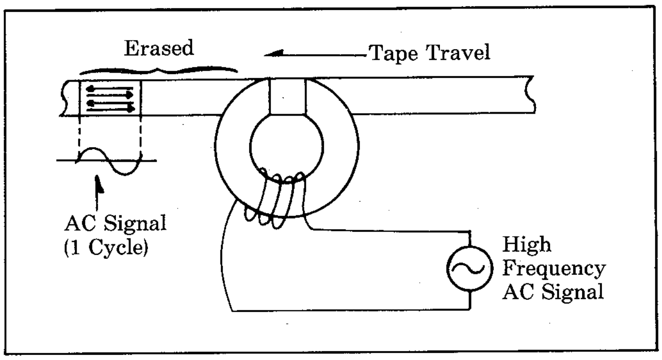


Fig. 3.

As the high frequency AC signal starts to go positive, the tape will start to be magnetized in one direction. But the AC signal will very quickly change its polarity, and this will be recorded on much of THE SAME PORTION of the tape, so North magnetic regions will be covered by South magnetic regions and vice versa. This results in zero signal on the tape, or selferasing. To keep the North and South regions separate, the head to tape speed must be increased. (See Fig. 3.)

When recording video, frequencies in excess of 4MHz may be encountered. Through experience, it is found that the head to tape speed must be in the region of 10 meters per second in order to record video signals.

The figure of 10 meters per second was also influenced by the size of the head gap. Clearly, the lower the head to tape speed, the easier it is to control that speed. If changes in head gap size were not made, the necessary head to tape speed would have been considerably higher. How the gap size influences this can be explained by Fig. 4.

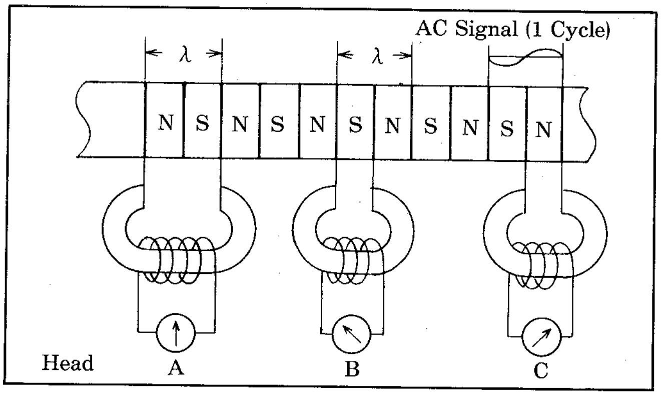


Fig. 4

Assume a signal is already recorded on the tape. The distance on the tape required to record one full AC signal cycle is called the RECORDED WAVELENGTH or λ. Head A has a gap width equal to λ. Here there is both North and South oriented magnetization across the gap.

This produces a net output of zero since North and South cancel. Head B and C have a maximum output because there is just one magnetic orientation across their gaps.

Maximum output occurs in heads B and C therefore, because their gap width is 1/2λ. (Heads B and C would also work if their gap width is less than 1/2λ.) The same is also true for recording. The maximum useable (no self-erasing) transfer of magnetic energy to the tape occurs when the gap width, G, can be expressed as.

$$G < \frac{\lambda}{2}$$

The RECORDING WAVELENGHT, can be expressed as:

$\lambda = \frac{V}{f}$ where V is the head to tape speed and f is the frequencies to be recorded.

as V increases, G is also allowed to increase for the same MAXIMUM frequency. Conversely if G is made very small, V is allowed to be reduced.

So, $G < \frac{V}{2f}$

In practice, G can be made as small as (and smaller than) 1μm (1×10^{-6} meters) and this puts V in the area of 10 meters per second. A head to tape speed of 10 meters per second is a very high speed, too high in fact to be handled accurately by a reel to reel tape machine of reasonable size. Also, tape consumption on a high speed reel to reel machine is tremendous.

The method employed in video recording is to move the video heads as well as the tape. If the heads are made to move fast, across the tape, the linear tape speed can be kept very low.

In 2-head helical video recording (the only format which will be discussed here) the video heads are mounted in a rotating drum or cylinder, and the tape is wrapped around the cylinder. This way, the heads can scan the tape as it moves. When a head scans the tape, it is said to have made a TRACK. This can be seen in Fig. 5.

In 2-head helical format, each head, as it scans across the tape will record one TV field, or 262.5 horizontal lines. Therefore, each head must scan the tape 30 times per second to give a field rate of 60 fields per second.

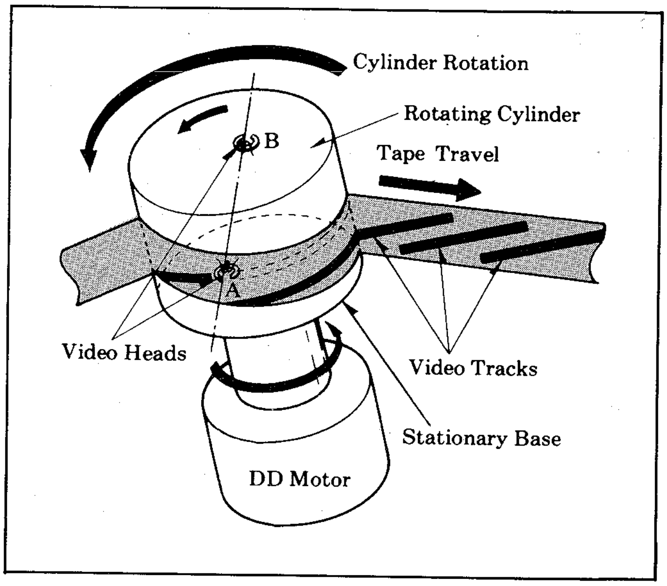


Fig. 5.

The tape is shown as a screen wrapped around the head cylinder to make is easy to see the video head. There is a second video head 180° from the head shown in front. Because the wraps around the cylinder in the shape of a helix (helica) the video tracks are made as a series of slanted lines. Of course, the tracks are invisible, but it is easier to visualize them as line. The two heads "A" and "B" make alternate scans of the tape.

An enlarged view of the video tracks on the tape can be shwon : Fig. 6

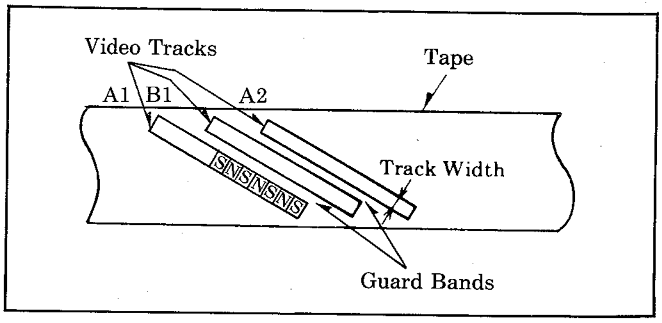


Fig. 6.

Refer to Fig. 6. The Video tracks are the areas of the tape where video recording actually takes place. The guard bands are blank areas between tracks, preventing the adjacent track's crosstalk from appearing on the track where the video head is tracking.

There is one more point about video recording which will be discussed here. Magnetic heads have the characteristic of increased output level as the frequency increases. Then, as determined by the gap width, the maximum output occurs at

approximately $G = \frac{V}{2f}$

In practice, the lower frequency output of the heads is boosted in level to equal the level of the higher frequencies. This process, as also used in audio applications, is called equalization.

Video frequencies span from DC to about 4MHz. This represents a frequency range of about 18 octaves. 18 octaves is too far a spread to be handled in one system (one machine). For instance, heads designed for operation at a maximum frequency of 4MHz will have very low output at low frequencies. Since there is 6dB/octave attenuation, $18 \times 6 = 108$dB difference appears. In practice this difference is too great to be adequately equalized. To get around this, the video signal is applied to an FM modulator during recording. This modulator will change its frequency according to the instantaneous level of the video signal.

The energy of the FM signal lies chiefly in the area from about 1MHz to 8MHz, just three octaves. Heads designed for use at 8MHz, can still be used at 1MHz, because the output signal can be equalized. Actually speaking, heads are designed for use up to about 5MHz. Therefore, some FM energy is lacked but it does not affect the playback video signal, because it is resumed in the playback process.

Upon playback, the recovered FM signal must be equalized then demodulated to obtain the video signal.

CONVERTED SUBCARRIER DIRECT RECORDING METHOD

The one method of color video recording that will be discussed here is the converted subcarrier method. In order to avoid visible beats in the picture caused by the interaction of the color (chrominance) and brightness (luminance) signals, the first step in the converted subcarrier method is to separate the chrominance and luminance portions of the video signal to be recorded. The luminance signal, containing frequencies from DC to about 4MHz, is then FM recorded, as previously described. The chrominance portion, containing frequencies in the area of 3.58MHz is down-converted in frequency in the area of 629kHz. Since there is not a large shift from the center frequency of 629kHz, this converted chrominance signal is able to be recorded directly on the tape. Also note that the frequencies in the area of 629kHz are still high enough to allow equalized playback. In pracitce, the CONVERTED CHROMINANCE signal and the FM signal are mixed and then simultaneously applied to the tape. Upon playback, FM and converted chrominance signals are separated. The FM is demodulated into a luminance signal again. The converted chrominance signal is reconverted back up in frequency area of 3.58MHz. The chrominance and luminance signals are combined which reproduces the original video signal.

1. VIDEO HEAD

A. The Need for New Video Heads

We have already discussed the reduced track width. This reduction requires the use of a smaller video head. Just making them smaller does not make them better. With less of actual head material to work with, the magnetic properties of the head suffers. To offset this a change in the head material is in order. Because the VHS recorder is designed to be small, a reduction in the size of the head cylinder was called for.

A reduction in the size (diameter) of the head cylinder changes the head to tape speed. Remember, the head to tape speed affects the high frequency recording capability of the head.

To offset this problem, the head gap size was reduced.

As is well-known. Azimuth Recording is utilized in VHS.

The heart of the Azimuth Recording process is in the video heads themselves. This requires still another change in head design.

B. Head Gap

1. Width

   As explained, the need for smaller head gap size be-came apparent. In VHS, the video heado have gap widths of a mere 0.3μm (0.3×10^{-6} meters).

   This is quite a contrast with ordinary video heads used in other helical applications whose gap widths are typically in the area of 1μm.
2. Azimuth

   Azimuth is the term used to define the left to right tilt of the gap if the head could be viewed staight on. In previous VTR applications the azimuth was always set to be perpendicular to the direction of the head travel across the tape, or more simply, the video track. Fig. 7 helps explain this.

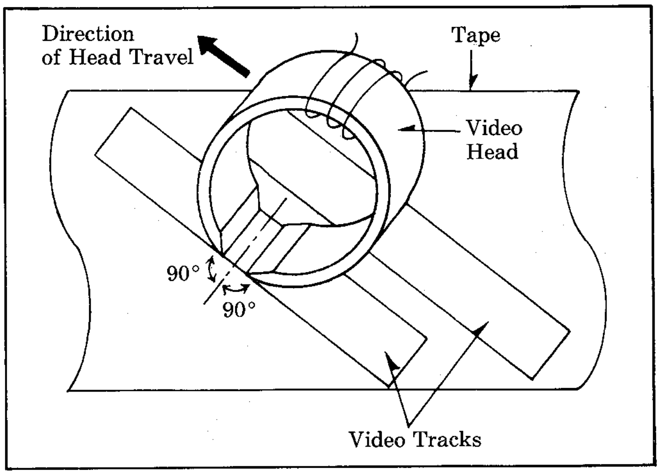


Fig. 7.

Fig. 7 shows that the gap is perpendicular to (90°) the head's movement across the tape. We can think of this standard as a perfect azimuth of 0°.

In VHS, the video heads have a gap azimuth other than 0° And more, one head has a different azimuth from the other. The 2 values used in VHS are azimuth of +6° and −6°. Refer to Fig. 8 and Fig. 9.

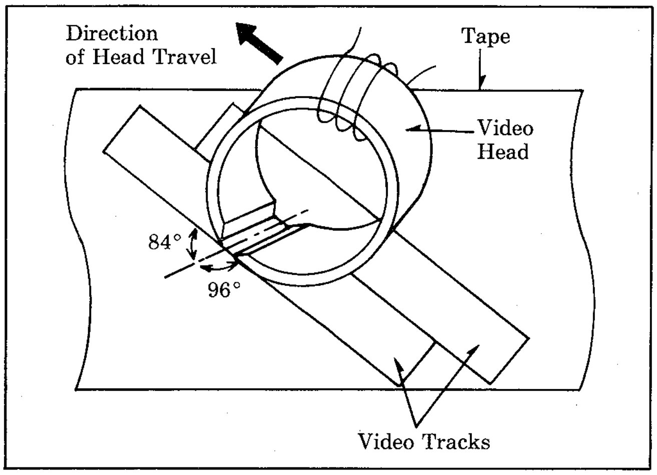


Fig. 8.

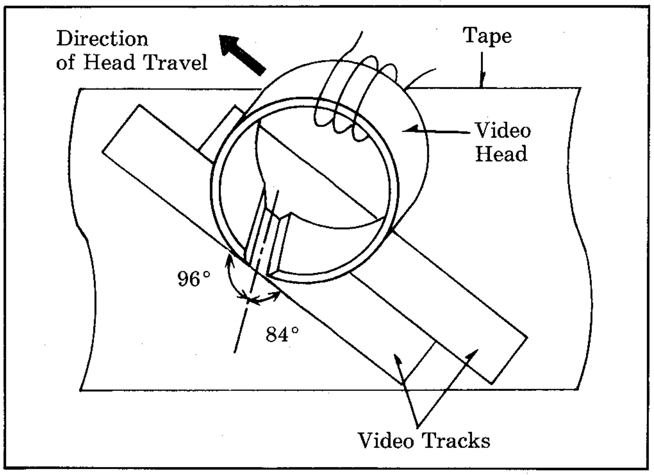


Fig. 9.

These heads make the VHS format different from most other VTR formats. Exactly how the azimuths of ±6° helps to keep out adjacent track interference is explained next.

2. AZIMUTH RECORDING

Azimuth Recording is used in VHS to eliminate the interference or crosstalk picked up by a video head. Again, because adjacent video tracks touch, or crosstalk, a video head when scanning a track will pick up some information from the adjacent track. The azimuths of the head gaps assure that video head "A" will only give an output when scanning across a track made by head "A". Head "B", therefore, only gives an output when scanning across a track made by head "B". Because of the azimuth effect, a particular video head will not pick up any crosstalk from an adjacent track. Let's examine this more closely.

In FIg. 10. we can see the VHS/SLP for cxample, video tracks with not-to-scale North and South magnetized regions on them.

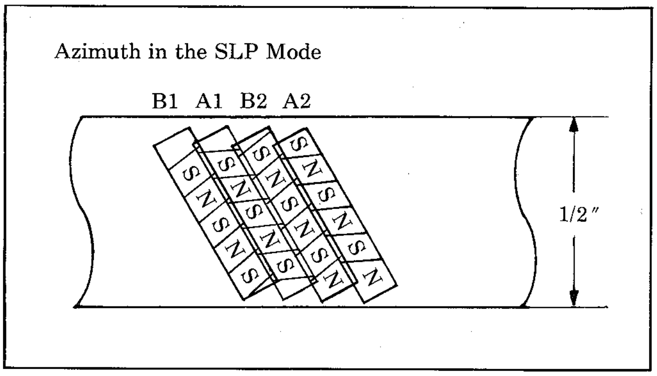


Fig. 10.

It can also be seen that these N or S regions are not perpendicular to the track, they have −6° azimuth in tracks A1, A2; and +6° azimuth in tracks B1, B2.

If we take track A1 and darken the N regions, it becomes easier to see Refer to Fig. 11.

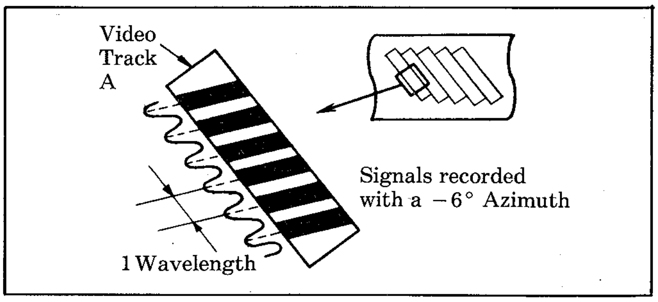


Fig. 11.

In Fig. 12, we see the information on track A, made by head "A". Imagine now that head "A" is going to play back this track, by superimposing the head over the track. Clearly, the gap fits exactly over the N and S regions, so that at any moment there is either an N region or an S region or an N to S (or S to N) transition across the gap. This produces maximum output in head "A". Now, visually superimpose the "B" head over the track. Here there are N and S regions across the gap at the same time, at any given moment. Remember that simultaneous N and S regions across the gap cause cancellation, and therefore no output. Looking at Fig. 9, we can see that the gap width is equal to 1/2 the recorded wavelength. Recall that this occurs at the highest frequency which is to be recorded.

So therefore, the azimuth effect works at these high frequencies.

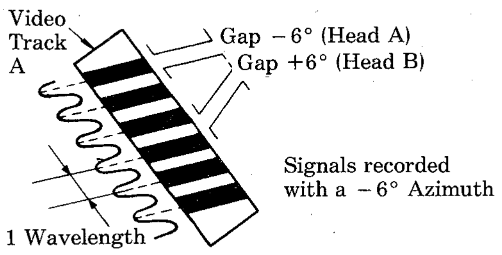


Fig. 12.

But what happens at lower frequencies? In Fig. 13, we see a diagram similar to Fig. 12, except the recorded wavelength is longer, which represents a lower frequency.

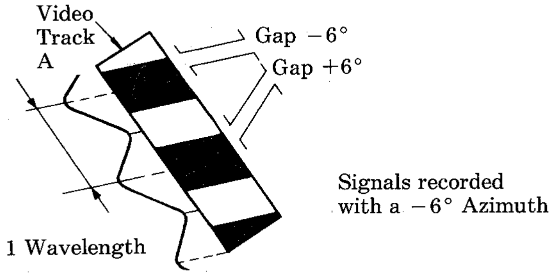


Fig. 13.

Again, visually superimpose the heads over the track. Head "A" is the same as before. But look at head "B". There is much less cancellation across the gap, and its output is close to that of head "A". Therefore, we see where the azimuth effect is dependent on frequency. The higher the frequency, the better the azimuth effect. The lower the frequency, the lower the separation by azimuth effect.

3. VHS COLOR RECORDING SYSTEM

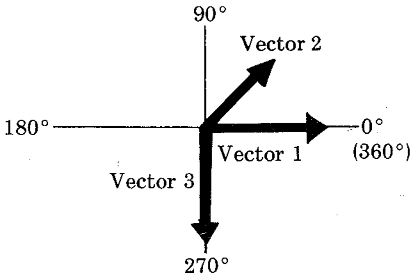
Because there is insignificant azimuth effect at lower frequencies, a new color recording system must be adopted.

The fact that crosstalk occurs at lower frequencies cannot be changed, this happens right at the tape during playback.

The method adopted processes the crosstalk component signals from the heads so that they are eliminated. It is important to realize that the crosstalk DOES STILL OCCUR. It is the recording/playback circuitry that performs the elimination.

In ordinary Helical VTR's using converted subcarrier direct recording, the phase of the chrominance signal is untouched, recorded directly onto the tape. The chrominance signal and its phase can be represented by vectors. Vectors graphically represent the amplitude and phase of ONE frequency. In this discussion, we will consider (for simplicity) the chrominance signal to be of one frequency. As an example of vectors, see Fig. 14.

The length of any vector represents its amplitude.



Vector 1 has a phase angle of 0°
Vector 2 has a phase angle of 45°
Vector 3 has a phase angle of 270°

Fig. 14.

We know that the azimuth effect will not work at the lower frequencies. And since the color information in VHS is recorded at low-converted frequencies, a new method of color recording was adopted.

Vector Rotation in Recording is actually a phase shift process that occurs at a horizontal rate, 15,734Hz.

The chrominance signal can be represented by a vector, showing amplitude and phase. (↑).

In ordinary Helical Scan VTR's the vector is of the same phase for every horizontal line, on every track as shown in Fig. 15.

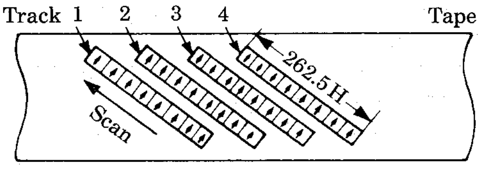


Fig. 15.

In VHS, we still convert the 3.58MHz down to a lower frequency, namely 629kHz, but the new color method used in VHS format is a process of vector rotation. During recording the CHROMINANCE phase of each horizontal line is shifted by 90°.

For head "A" (CHANNEL 1) we ADVANCE the CHROMINANCE phase by 90° per horizontal line (H).

For head "B" (CHANNEL 2) we DELAY the chrominance phase 90° per H.

VECTOR (PHASE) ROTATION:

CHANNEL 1 +90°/H
CHANNEL 2 −90°/H

Fig. 16 shows what this looks like on tape.

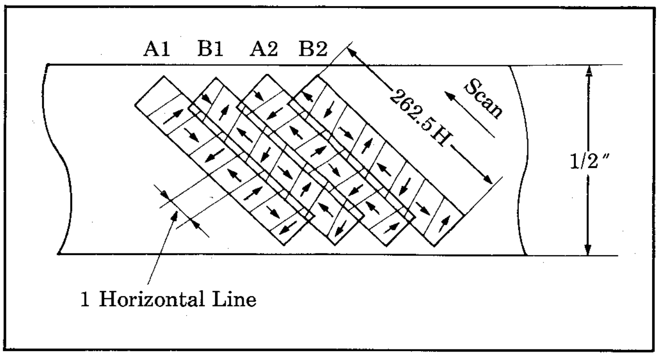
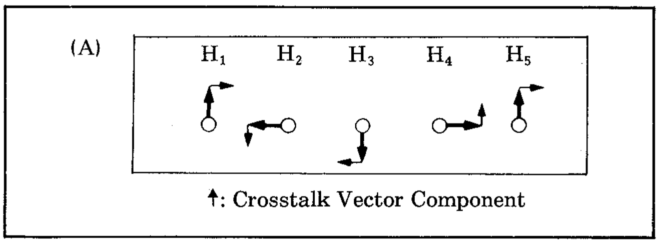

A1
B1
A2
B2
262.5H
Scan
1/2″
1 Horizontal Line

Fig. 16.

Now assume that head "A" plays back over track A1 it will produce a vector output as such:


(A)
H_1
H_2
H_3
H_4
H_5

↑: Crosstalk Vector Component

Fig. 17

Head "A" when tracking over A1 will have an output consisting of the main signal (large vectors) and some crosstalk components (small vectors).

Fig. 17, then is a vector representation of the playback chrominance signal from the head.

One of the most important things down in the playback process is the restoration of the vectors to their original phase. This is done by the balanced modulator in the playback process.

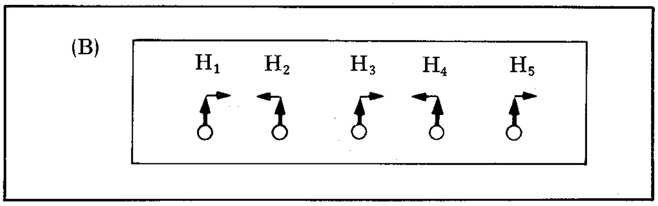

(B)
H_1
H_2
H_3
H_4
H_5

Fig. 18.

This restored signal is then split 2 ways. One path goes to one input of an adder. The other path goes to a delay line which delays the signal by 1 H. The output of the delay line goes to the other input of the adder. Fig. 19 explains.

As can be seen in Fig. 21, the crosstalk component has been eliminated after the first H line. We have now a chrominance signal free of adjacent channel crosstalk.

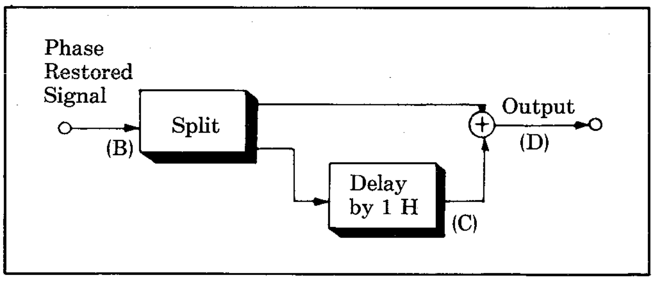

Phase Restored Signal
(B)
Split
Delay by 1 H
(C)
Output
(D)

Fig. 19.

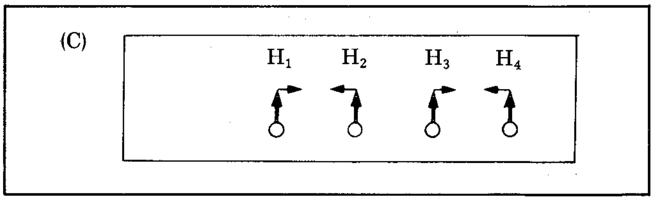


Fig. 20.

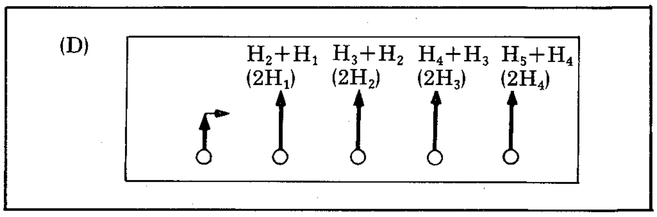

(D)
H_2+H_1 $(2H_1)$
H_3+H_2 $(2H_2)$
H_4+H_3 $(2H_3)$
H_5+H_4 $(2H_4)$

Fig. 21.

The double output in Fig. 21 is not a problem because it can always be reduced. The process of adding a delayed line to an undelayed line is permissable because any 2 adjacent lines in a field contain nearly the same chrominance information.

So, if 2 adjacent lines are added, the net result will produce no distortion in the playback picture.

In conjunction with the crosstalk elimination is the reconversion of the chrominance 629kHz to its original 3.58MHz. Now the color signal is totally restored.

GLOSSARY OF TERMS

ACC

Automatic Color Control used to maintain an overall constant color signal level in the color circuits.

ACK

Automatic Color Killer.

Adjacent Track

This is the name of the video track to the immediate left or right of the track of concern.

AFC

Automatic Frequency Control used to phase-lock the color circuits to either the recording or playback color signal, in order to achieve a stable color signal.

AFT

Automatic Fine Tuning...This is a special circuit found in most recent TV sets which makes the local oscillator of the TV tuner follow the channel of concern in order to produce a stable IF frequency. In other words, if for any reason the TV station being received changes frequency, the AFT circuit will automatically compensate so that no interference will be seen on the screen, i.e., no manual fine tuning is necessary.

AGC

Automatic Gain Control used to maintain an overall constant picture level in the luminance circuits.

APC

Automatic Phase Control used to help phase lock the color circuits to either the recording or playback color signal in order to achieve a stable color signal.

Azimuth

A term used to describe the left to right tilt of the gap of a recording head, if it could be viewed straight on.

Balanced Modulator

A circuit so designed to give as an output the frequency sum or frequency difference of its two input signals. Any special characteristics of one of the input signals will be present in the output signal.

Beats

A term used to described the unwanted signals produced when two original signals are allowed to be mixed together.

Bipolar PG

Pulse Generator signals that have both positive and negative excursions.

Burst

A short time occurence (8 to 10 cycles) of the 3.58MHz subcarrier signal, appearing right after horizontal sync but centered on the blanking portion of the video waveform. Burst is used to keep the color oscillator of a TV receiver locked to the broadcast station.

B/W

Abbreviation for Black and White.

C

Capacitor.

C Signal

The color portion of a video signal.

Capstan

A small rotating metal dowel which drives the recording tape to assure positive tape movement.

Chroma

The color portion of a video signal.

Chrominance

The color portion of a video signal.

Clamp

The process of giving an AC signal a specific DC level.

Control Signal

A special signal recorded onto the video tape which is used during playback as a reference for the servo circuits.

Converted Subcarrier

This is the process of frequency shifting the color 3.58MHz subcarrier and its sidebands down to 629kHz.

Crosstalk

The name given to the unwanted signals obtained when a video head picks up information from an adjacent track.

CUE

To scan the playback picture at a faster than normal speed in the Forward direction.

D

Diode.

DL

Delay Line.

Dark Clip

After emphasis, the negative going spikes (undershoot) of a video signal may be too large in amplitude for safe FM modulation. A dark clip circuit is used to cut off these spikes at an adjustable level.

DDC

Direct Drive Cylinder...as used in VHS, this means that the video heads are driven by a self-contained brushless DC motor using no belts or gears. DD cylinders produce pictures with better stability.

Delta Factor (Δf)

A term used to indicate that a playback signal off the video tape has some jitter or "wow and flutter". Δf, or "a change in frequency" means that the color signal off the tape is not a stable frequency of 629kHz, but rather a signal whose frequency at any instant is some small amount above or below 629kHz.

Deviation

A term used to describe how far the FM carrier swings when it is modulated. In VHS the upper limit is 4.4MHz.

Dew Detector

A variable resistor whose resistance value depends upon the ambient humidity.

Dihedral

A term used to describe the relative position between the two video heads as they are mounted in the head cylinder. Perfect dihedral means that the tips of the heads are exactly 180° apart.

Dropout

A momentary absence of FM or color signal off the tape, whether due to uneven oxide or a coating of dust on the tape or video heads.

Duty Cycle

In describing a rectangular waveform, the "duty" refers to the percentage of off time and on time for one complete cycle. 50—50 means that there are equal periods of off time and on time for one cycle and this would be a square wave.

E-E

Electronics to Electronics...this is the picture viewed on the TV set when a recording is being made. This picture goes through some but not all of the circuits of the recorder and is used to test the operation of said circuits.

EQ

Shortened form of "Equalization", used in the audio circuits.

Emphasis

The process of boosting the level of the high frequency portions of the video signal.

FG

Frequency Generator used in the servo circuits.

FL

Filter.

FM Signal

The luminance portion of the video signal is used to control the frequency of astable multivibrator. The output of this multivibrator is a frequency modulated (FM) signal shifting from 3.4MHz to 4.4MHz (plus sidebands).

Field

One half of a television picture. A field consists of 262.5 horizontal scanning lines across the picture tube. Two fields are necessary to complete a fully scanned TV picture (frame). First, one field is "sprayed" on the picture tube, starting at the top of the tube with Line 1, and ending at the bottom with Line 262.5. Then, the next field begins at the top of the tube again with Line 262.5 and ends at the bottom with Line 525. The lines of the second field lie in-between the lines of the first field. This property of falling in-between lines is called "interlacing". The two sweeps of the picture tube, or two fields make up one complete TV picture of "frame". Frame repetition is 30Hz, therefore field repetition is 60Hz.

Flagwaving

This is the term used to describe a TV sets ability to accept unstable playback pictures from a video tape recorder. All home VTR's have some degree of playback instability. A TV set with a long horizontal AFC time constant may not recover from the VTR's instability before the active picture is being scanned. This can cause a bending or flapping from side to side of the top inch or so of the screen. This movement is called "flagwaving".

Frame

One complete TV picture. See "Field".

Gate

A circuit which will deliver an output only when a specific combination of its inputs are present. For use in analog or digital applications.

Guard Band

This is the space between video tracks on the video tape in the SP mode. Guard bands contain no information.

Hall Effect IC

An external magnetic field causes current to flow in this type of device.

HD

Horizontal Drive signal.

Head Cylinder

A cylindrical piece of metal which houses the video heads. The tips of the heads protrude slightly from the surface of the cylinder so that they may scan the tape as the cylinder spins.

Head Switching

The action of turning off during playback, the video head which is not in contact with the video tape. A particular video head will be turned off 30 times per second. This is done so that the head which is not scanning the tape, and therefore not delivering a good signal, cannot contribute any noise to the playback signal.

Head Switching Pulse

The signal which is applied to the Head Amplifier to perform head switching. This is a square wave at 30Hz, with a 50—50 duty cycle.

Helical

A word used to describe a general type of VTR in which the tape wraps around the video head cylinder in the shape of a 3-dimensional spiral, or "helix". The video tracks are recorded as a series of slanted lines.

IC

Integrated Circuit.

Interchangeability

A term used to describe how well a particular VTR will play back a tape recorded on another VTR of the same type. Good interchangeability indicates good playback.

Interlacing

The property of the scan lines of two television fields to lie in-between each other. See "Field".

Interleaving

A term used to indicate that the harmonics of the chrominance signal lie in-between the harmonics of the luminance portion of the video signal as it is viewed on a spectrum analyzer. This means that the color information of a video signal does not interfere with, although it is broadcast at the same time as, the luminance information.

Also, signals which have this interleaving property are not readily seen on a TV screen, because of their virtual cancellation characteristics.

Interleaving signals (fi) must have the following frequency relationship:

$$fi=\left(\frac{2n+1}{2}\right)\times fH \quad (n=0,\ 1,\ 2,\ 3,\ 4......)$$

$fH=15{,}734\,Hz$ (H sync frequency)

Jitter

The name of the effect on the playback picture if a VTR has too much "wow and flutter". The picture appears to have a rapid shaking movement.

L

Coil.

Luminance

This is the portion of video signal which contains the sync and B/W information.

MMV

Monostable Multi-Vibrator...Usually an IC device which gives a logic high or low output with a variable duration upon receipt of an input pulse or transition.

Non-Linear Emphasis

This is similar to regular emphasis with the difference that small level high frequency portions of the signal are given more of a boost than higher level high frequency portions.

NTSC

The National Television Systems Committee. These four letters identify the United States color television standard.

O.T.R.

One Touch Recording (O.T.R.) enables you to do impromptu timer recordings at any time. When you have to go out for urgent matters or you are going to sleep, this function is very useful. Just select the channel and push the O.T.R. Button for 30 minutes to 2 hours of recordings. After recording, the VCR will be turned off automatically.

PG

Pulse Generator used in the servo circuits.

Q

A term used to describe the graphic response of a filter or tuned amplifier.

R

Resistor.

Review

To scan the playback picture at a faster than normal speed in the Reverse direction.

RF

Radio Frequencies.

Rotary Chroma

The name of the process used in VHS to change the phase of the chrominance signal at a rate of 15,734 (same as H sync frequency) times per second.

Rotary Transformer

A device used to magnetically couple RF signals to and from the spinning video heads, thus eliminating the need for brushes.

Sample and Hold

A process used in comparator circuits by which the value of a particular signal is measured at a specific moment in time...then this value is stored for later use.

Search

To scan the playback picture at a faster than normal speed in either the forward or reverse direction.

Servo

Short for Servo mechanism. This is an electro-mchanical device whose mechanical operation (for instance motor speed) constantly being measured and regulated so that it closely matches or follows an external reference.

Skew

Another way of saying Tension Error. Skew is actually the change of size or shape of the video tracks on the tape from the time of recording to the time of playback. This can occur as a result of poor tension regulation by the VTR, or by ambient conditions which affect the tape.

Subcarrier

The name of the 3.58MHz continuous wave signal used to carry color information.

SS

Slow and Still.

T

Transformer.

TP

Test Point.

TR

Transistor.

Tension Error

See "Skew".

Time Base Stability

A term used to describe how closely the playback video signal from a VTR matches an external reference video signal...in regard to sync timing rather than picture content.

Tracking

This is the action of the spinning video heads during playback when they accurately track across the video RF information laid down during recording. Good tracking indicates that the heads are positioning themselves correctly, and are picking up a strong RF signal. Poor tracking indicates that the heads are off track, and picking up low level RF signal or noise.

VCO

Voltage Controlled Oscillator...An oscillator whose frequency of oscillation is governed by an external voltage.

Video Head

This is the electro-magnet used to develop magnetic flux which will put RF information on the tape. In VHS, two video heads are mounted in a rotating cylinder around which the video tape is wrapped. As the cylinder spins, each video head is allowed to alternately scan the tape.

Video Track

The name of the RF information laid down during recording, as a particular video head scans across the tape.

VHS

Video Home System.

VTR

Video Tape Recorder.

VV

Video to Video...or...the actual playback picture produced from a tape during playback.

VXO

Voltage Controlled Crystal Oscillator...Similar to VCO except that a quartz crystal is sued as a reference which can be varied.

White Clip

After emphasis, the positive going spikes (overshoot) of the video signal may be too large for safe FM modulation. A white clip circuit is used to cut off these spikes at an adjustable level.

XTAL

Abbreviation for crystal.

Y Signal

The B/W portion of a video signal containing B/W information and sync.

ORDER NO. VRD-7810-303

Service Manual

Video Cassette Recorder

Panasonic VHS™
Omnivision IV

PV-1100

Vol. 2

Troubleshooting Guide
Electrical Adjustment Procedures
Mechanical Adjustment Procedures

SPECIFICATIONS

Power Source: 120VAC±10%, 60Hz±0.5%
Power Consumption: Approx. 29 watts
Television System: EIA Standard (525 lines, 60 fields)
NTSC color signal
Video Recording System: 2 rotary heads helical scanning system
Luminance: FM azimuth recording
Chrominance: Converted subcarrier phase shift recording
Audio Track: 1 track
Tape Format: Tape width 1/2″ (12.7mm), high density tape
Tape Speed: SP mode: 1-5/16 i.p.s (33.35mm/s)
LP mode: 21/32 i.p.s (16.67mm/s)
Record/Playback Time: 1 or 2 hours with NV-T60
2 or 4 hours with NV-T120
FF/REW Time: Less than 4.5 min with NV-T120
Heads: Video: 2 rotary heads
Audio/Control: 1 stationary head
Erase: 1 full track
1 audio track erase for audio dubbing
Input Level: Video: Video IN Connector (RCA type)
1.0Vp-p, 75Ω unbalanced
Audio: MIC Jack (1/4″ PHONO JACK)
−70dB, 600Ω unbalanced
Audio IN Jack (RCA type)
−20dB, 100kΩ unbalanced
TV Tuners: VHF Input: VHF Ch2-Ch13,
65−90dBμ, 75Ω unbalanced
UHF Input: UHF Ch14-Ch83,
65−90dBμ, 300Ω balanced

Output Level: Video: Video OUT Connector (RCA type)
1.0Vp-p, 75Ω unbalanced
Audio: Audio OUT Jack (RCA type)
−6dB, 600Ω
unbalanced
RF Modulated: Ch3/Ch4 switchable,
72dBμ, 75Ω unbalanced
Video Horizontal Resolution: Color: more than 230 lines
B/W: more than 270 lines
Signal-to-Noise Ratio: Video: SP mode: better than 40dB
LP mode: better than 40dB
(Rohde & Schwarz noise meter)
Audio: SP mode: better than 42dB
LP mode: better than 40dB
Operation Temperature: 41°F−104°F (5°C−40°C)
Operating Humidity: 10%−75%
Weight: 35.3/4lbs (16.3kg)
Dimensions: 19-1/8″(W)×15-1/2(D)×6-7/8(H)
(485mm×394mm×175mm)
Accessories Supplied:
- Blank tape
- Remote control unit
- 75Ω −300Ω matching transformer
- 300Ω −75Ω matching transformer
- Coaxial cable (5ft)
- F type connectors
- Twin lead wire (5ft)
- Dust cover
- Terminal Block

Available Tapes: 1/2″ VHS video cassette tapes
NV-T120 Approx. 810ft. (247m), 2 or 4 hrs.
NV-T60 Approx. 417ft. (127m), 1 or 2 hrs.

Weight and dimensions shown are approximate. Specifications are subject to change without notice.

Panasonic®

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TROUBLESHOOTING GUIDE

A. Operational Troubles

Before you try to make adjustments or repairs, be sure to check the following items, because some trouble may be nothing more than mis-operation.

Item	Symptom	Cause	Countermeasure
A-1	No operation at all	A. Power switch is not pressed.	Press the power switch to turn the recorder ON.
		B. Timer switch on the built-in timer is set to the "ON" position.	Set the timer switch to OFF position.
A-2	No lock of operation buttons though you can press them.	A. Dew indication lamp is illuminating.	Wait till the lamp goes off.
		B. Power indication lamp is not illuminating.	Check the AC cord.
A-3	Auto stop during Rewind.	A. Tape counter memory switch is set to the "ON" position.	Set the switch to the "OFF" position.
		B. Tape is damaged.	Cut the damaged portion of tape and splice with a splicing tape (VFS1).
A-4	Record button is locked and cannot be pressed.	A. The tab on the cassette is broken.	Cover hole with cellophane tape.
A-5	Cannot watch an on-the-air TV program.	A. The TV/VTR selector on the top panel is set to the "VTR" position.	Set the selector to the "TV" position.
A-6	Cannot record an on-the air TV program.	A. The input selector on the front panel is set to the "Camera" position.	Set the selector to the "TV" position.
		B. Antenna cable is poorly connected.	Connect it correctly.
A-7	No sound during an on-the-air TV program recording.	A. Microphone is connected to the Mic jack on the front panel.	Disconnect the microphone.
A-8	No playback image.	A. The TV/VTR selector is set to the "TV" position.	Set the selector to the "VTR" position.
A-9	Noisy picture during playback.	A. The tracking control on the top panel is mis-adjusted.	Adjust the control correctly.

Fig. 32

B. Cleaning

The following symptoms are usually corrected by cleaning the head(s) as stated below. If the symptom remains after cleaning, make mechanical adjustments according to the mechanical adjustment procedures.

Item	**Symptom**	**Cause**	**Countermeasure**
B-1	Snow noise on a playback image.	Video head clogging.	Clean the video heads with a head cleaning stick (part No. VFK27)
B-2	Periodic noise on a playback image.	Control head clogging.	Clean the control head with a head cleaning stick (part No. VFK27).
B-3	Little or no sound.	Audio head clogging.	Clean the audio head with a head cleaning stick (part no. VFK27)

Fig. 33

Item	Symptom	Cause	Countermeasure
B-4	Unstable tape transportation.	Parts need cleaning.	Clean the following parts.

B-4-1. TOP VIEW

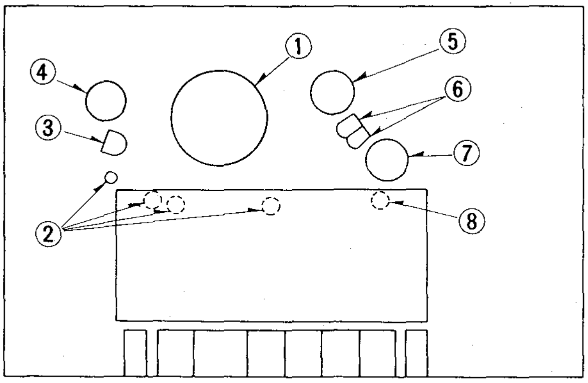


Fig. 34

① Cylinder.
② Posts
③ Full Erase Head
④ Supply Inertia Roller
⑤ Takeup Inertia Roller
⑥ Audio/Control and Audio Erase Heads
⑦ Pressure Roller
⑧ Capstan Shaft

B-4-2. UNDER THE CASSETTE COMPARTMENT

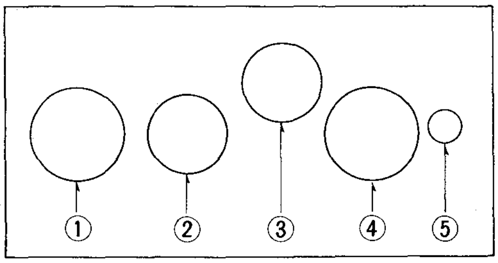


Fig. 35

① Supply Reel
② Rewind Roller
③ Fast Forward Idler
④ Takeup Reel
⑤ Play Roller

B-4-3. BOTTOM VIEW

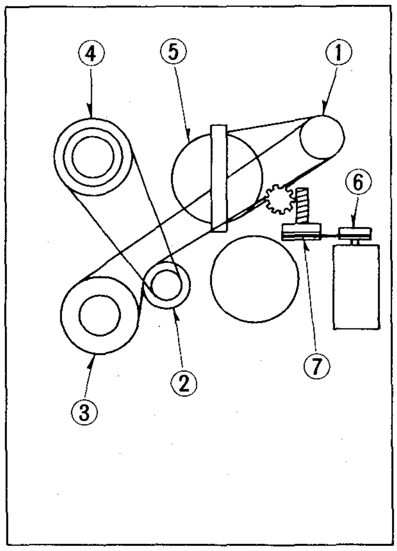


Fig. 36

① Capstan Motor Pulley
② Intermediate Pulley
③ Main Pulley
④ Play Pulley
⑤ Capstan Flywheel
⑥ Loading Motor Pulley
⑦ Pinion Gear Pulley

C. Confirmation of Normal Functions

The following charts show when the operation buttons are locked or released.

C-1. When a cassette tape is NOT inserted:

- Cassette Compartment......UP.

Button Power	Eject	Rewind	Stop	F.Fwd	Play	Record	Audio Dub	Pause
ON	2	3	2	3	3	3	3	3
OFF	2	3	2	3	3	3	3	3

Fig. 37

- Cassette Compartment......Down.

Button Power	Eject	Rewind	Stop	F.Fwd	Play	Record	Audio Dub	Pause
ON	2	2	2	2	2	3	3	3
OFF	2	1	2	1	1	3	3	3

Notes:

1...By pressing the button, it is locked. 2...Possible to press the button but not to be locked.
3...Cannot press the button.

Fig. 38

C-2. When a cassette tape is inserted and the cassette compartment is depressed:

Button Power	Eject	Rewind	Stop	F.Fwd	Play	Record	Audio Dub	Pause
ON	2	1	2	1	1	1	3	3
OFF	2	1	2	1	1	1	3	3

Notes:

1...By pressing the button, it is locked. 2...Possible to press the button but not to be locked.
3...Cannot press the button.

Fig. 39

C-3. When a cassette tape is inserted, depressing the cassette compartment, and then while the unit is operated in each mode.

Button Mode	Eject	Rewind	Stop	F.Fwd	Play	Record	Audio Dub	Pause
Stop	5	4	6	4	4	4	7	7
Fast Forward	7	7	5	—	7	7	7	7
Play	7	7	5	7	—	7	4	4
Record/Play	7	7	5	7	—	—	7	4
Rewind	7	—	5	7	7	7	7	7
Eject	—	7	6	7	7	7	7	7
Audio Dub	7	7	5	7	—	7	—	4
Play-Pause	7	7	5	7	—	9	10	11
Record/Play-Pause	7	7	5	7	—	—	7	12
Play/Audio Dub-Pause	7	7	5	7	—	7	—	13

Fig. 40

Notes:

4...The button is possible to press, being locked and the operation is performed.
5...The button is possible to press but not to be locked. The operation itself is performed.
6...The button is possible to press but not to be locked. The operation is not performed.
7...The button cannot be pressed.
8...The mode is released.
9...This mode is changed to the Pause in the Record/Play mode.
10...This mode is changed to the Pause in the Play/Audio Dub mode.
11...This mode is released, and changed to the Play mode.
12...This mode is released, and changed to the Record/Play mode.
13...This mode is released, and changed to the Play/Audio Dub mode.

C-4. Counter Memory Confirmation

C-4-1. Set the memory switch to the "ON" position.

C-4-2. Make sure that the counter memory works as shown below.

During Rewind.........Counter 999
Auto Stop

C-4-3. In the playback or fast forward mode, the counter memory doesn't work.

C-5. Pause Button and Remote Pause Confirmation

During Record or Playback, when the pause button is pressed or the Remote Pause terminal is grounded, the unit is set to the Pause mode. The image on a TV monitor still appears or disappears according to the mode.

During Playback.........Tape stops and the image disappears on a TV monitor.
During Record............Tape stops but the image still appears on a TV monitor.

D. Technical Troubleshooting Guide (Mechanism)

Item	Symptom	Detailed Symptom	Countermeasure
D-1	No operation of Playback, Rewind and Fast Forward.	A. Power indication lamp doesn't illuminate.	• Check the Power Supply and the Regulator Circuits. • Check the transformer.
		B. • Possible to lock the F. Fwd. or Rew. button but no tape movement at all. • When the Play button is pressed, the loading operation starts but within a few seconds, the operation is stopped.	Check the capstan motor.
		C. When the power switch is turned ON, the pressure roller solenoid works but within a few seconds, it is released and no operation of F. Fwd., Play and Rewind.	Check the loading completion switch.
		D. Each button is locked but no operation.	Check the reel belt.
		E. • Each button is not locked. • Power indication lamp is illuminating.	Check the sensor lamp.
		F. Dew indication lamp is illuminating.	Check the Dew sensor.

Item	Symptom	Detailed Symptom	Countermeasure
D-2	No Rewind operation.	A. • Rewind button is not locked. • When a tape forwards till the end of it (translucent portion), no automatic Stop.	Check the supply photo TR.
		B. The rewinding speed is very slow.	Check the reel belt, rewind roller and the tape itself.
		C. The rewind button is possible to be locked but no tape movement. (Play and F.F modes are in correct operation.)	• Check the rewind switch on the circuit board.
		D. The rewind button is possible to be locked but no operation. (Play and F.F. modes are in abnormal operation.)	• Check the reel belt.
D-3	No Fast Forward operation.	A. • F.Fwd. button is not locked. • When a tape is rewound completely (translucent portion), no automatic stop operation.	Check the takeup photo TR.
		B. The F.Fwd. speed is very slow.	Check the reel belt, rewind roller, FF idler and the tape itself.
		C. The F.Fwd button is possible to be locked but no operation. (Rewind and Play modes are in correct operation.)	Check the F.F switch on the transport circuit board.
		D. The F.Fwd button is possible to be locked but no operation. (Rewind and Play modes are in abnormal operation.)	Check the reel belt.
D-4	No playback operation.	A. After loading completion, within a few seconds, the unit automatically stop and the tape comes back into the cassette case. (Before, beginning above movement, picture and sound are in normal for a few seconds.)	• Check the reel sensor, counter belt, play roller, and reel belt.
		B. After loading completion, within a few seconds, the unit automatically stops and the tape comes back into the cassette case. (Before, beginning above movement, picture and sound are in normal for a few seconds.)	• Check the pressure roller solenoid and capstan belt.
		C. After loading completion, within a few seconds, the unit automatically stop and no unloading operation.	Check the unloading completion switch.
		D. After loading completion, the loading motor is still rotating. At that time no sound and image.	Check the loading completion switch.

Item	Symptom	Detailed Symptom	Countermeasure
		E. No loading operation.	Check the play switch on the transport circuit board and the tape slack switch (micro switch).
		F. After loading completion, the tape movement stops though the capstan motor is rotating.	Check the pause switch.
D-5	Abnormal loading or unloading operation.	A. No loading or unloading.	Check the loading belt and loading motor.
		B. During Playback, when the Stop button is pressed, no unloading operation, and the power indication lamp turns off after 6—7 seconds.	Check the play switch on the transport circuit board.
		C. When the power switch is turned on, the loading motor rotates and doesn't stop at all.	Check the unloading completion switch.
D-6	No automatic stop operation.	A. When a tape is forwarded till the end of it (translucent portion) on Play or F.F modes, no automatic stop.	Check the takeup photo TR.
		B. When a tape is rewound completely (translucent portion), no automatic stop.	Check the supply photo TR.
D-7	No tape counter operation.	A. Tape counter is not rotated.	Check the counter belt (B).

Fig. 41

The Method of Check

Pressure Roller Solenoid

Unsolder the brown lead wire from the solenoid and check the resistance of it with the tester.
The correct resistance should be about 20Ω.

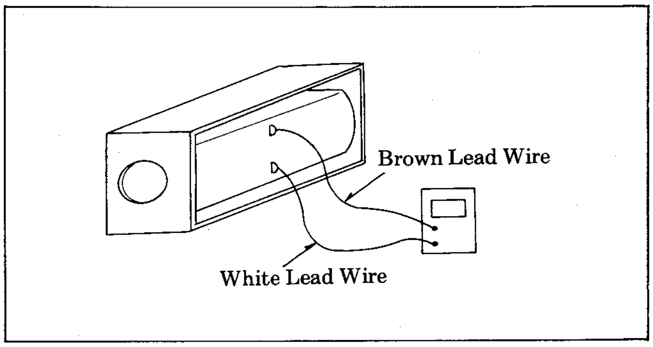


Fig. 42

Photo Transistors

Blind the each photo transistor from the light of lamp. And check the voltage of each collector when the unit is turned on.
And also check the voltage of each collector when the unit is turned on and without blinding transistors. (The condition that each transistor is sensing light).
The correct voltage in each condition should be as follow.

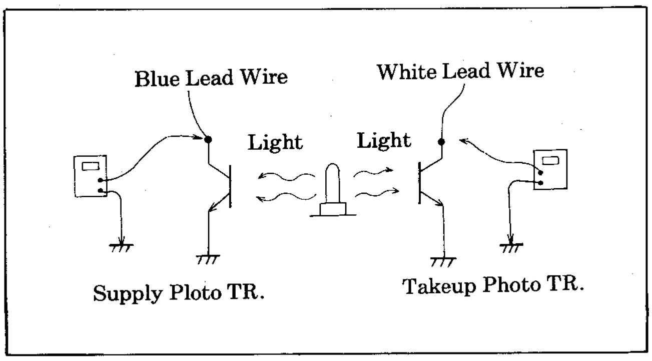


Fig. 43

When transistor is good.

	Collector Voltage	Tester Range
Sensing	0V−1V	Range: 1V
Blinded	7V−9V	Range: 50V

Fig. 44

When transistor is defect.

or

	Collector Voltage	Collector Voltage
Sensing	0V	8V
Blinded	0V	8V
Photo TR	(Shorted)	(Open)

Fig. 45

Dew Sensor

Check the resistance of Dew Sensor. If the resistance is less than 20KΩ, the sensor is good.

Note: When checking the resistance, use only the tester that contains internal batteries (1.5 and/or 3.0V. DC).

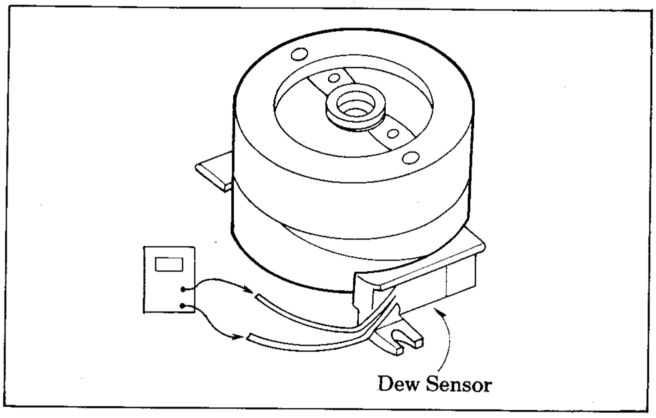


Fig. 46

Rewind Switch

Check the resistance between two points, (A) and (B) indicated in the Fig. 47.
When the Rewind Button is locked, the resistance should be 0 (zero) Ω. And when the Rewind Button is released, the resistance should be 3KΩ.

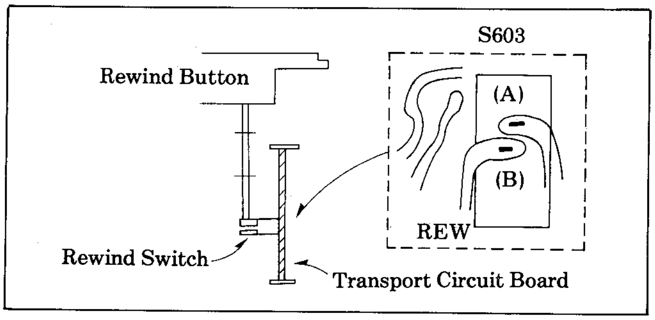

S603
Rewind Button
(A)
(B)
REW
Rewind Switch
Transport Circuit Board

Fig. 47

Play Switch

Check the resistance between two points (A) and (B) indicated in the Fig. 48.
When the Play Button is locked, the resistance should be 0 (zero) Ω. And when the Play Button is released, the resistance should be about 3KΩ.

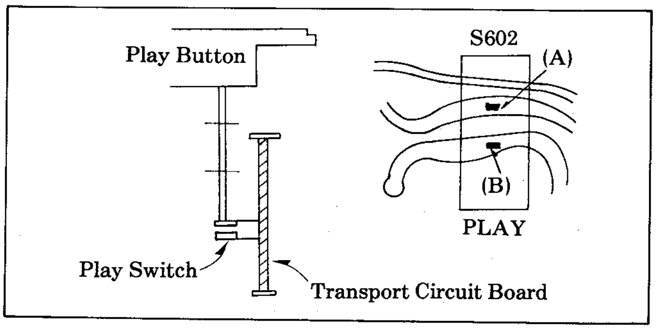

Play Button
S602
(A)
(B)
PLAY
Play Switch
Transport Circuit Board

Fig. 48

Tape Slack Switch [Micro Switch]

Unplug the 3-pin connector and check the resistance between two points, (A) and (B) indicated in the Fig. 49.
When the switch is turned on condition, the resistance should be 0 (zero) Ω. And when the switch is turned off condition, the resistance should be ∞.

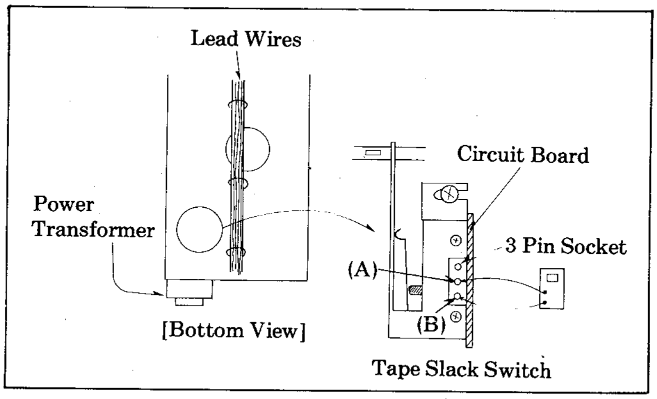

Lead Wires
Circuit Board
Power Transformer
3 Pin Socket
(A)
(B)
[Bottom View]
Tape Slack Switch

Fig. 49

Unloading Completion Switch

1. At the Stop Condition.
   Make sure that the lower switch (Unloading Completion Switch) is turned on, and unplug the 3-pin connector. Then, check the resistance between the Pin No. 1 and the chassis (ground).
   The resistance should be 0 (zero) Ω. (Tester Range: ×1)
2. At the Loading Condition.
   Turn the power switch off when the unit is on the way of loading operation. Then check the resistance between the Pin No. 1 and the chassis (ground).
   The resistance should be ∞ Ω. (Tester Range: ×1)

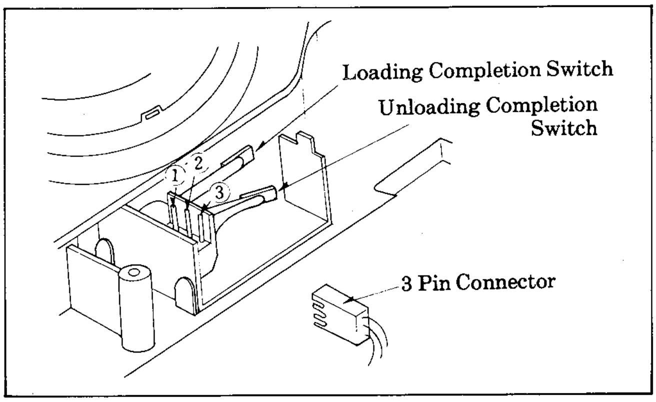

Loading Completion Switch
Unloading Completion Switch
①
2
③
3 Pin Connector

Fig. 50

Loading Completion Switch

1. At the Loading Completed Condition.
   Make sure that the upper switch (Loading Completion Switch) is turned on, power switch is turned on and unplug the 3-poin connector.
   Then check the resistance between the Pin No. 2 and the chassis (ground).
   The resistance should be 0 (zero) Ω. (Tester Range: ×1)
2. At the Stop Condition.
   Check the resistance as the same way described above when the unit is stopped.
   The resistance should be ∞ Ω. (Tester Range: ×1)

Pause Switch

Check the resistance between two points (A) and (B) indicated in the Fig. 51.
When the Pause Button is locked, the resistance should be 0 (zero) Ω. (Tester Range: ×1)
And when the Pause Button is released, the resistance should be among 600Ω and 3KΩ. (Tester Range: ×1)

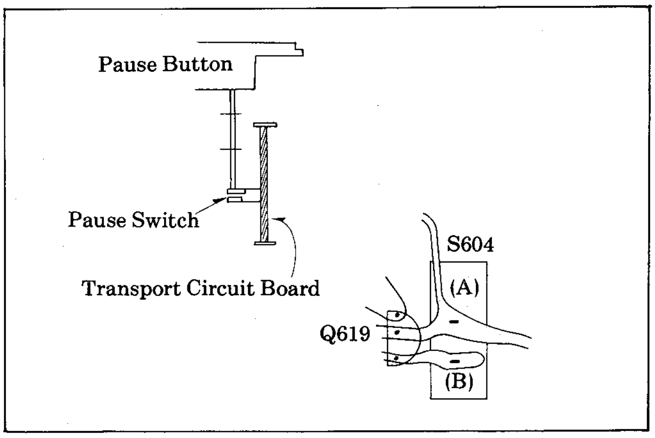

Pause Button
Pause Switch
Transport Circuit Board
S604
(A)
Q619
(B)

Fig. 51

Reel Sensor

Before you check the voltage, make sure that the Connecting Pulley is rotating. Then check the voltage at the Pin No. 2 of the connector (P614) when the unit is in Play mode.
The voltage should be among 2V and 7V when the reel sensor is normal.
And the voltage should be 12V or 0 (zero) V when the reel sensor is abnormal.

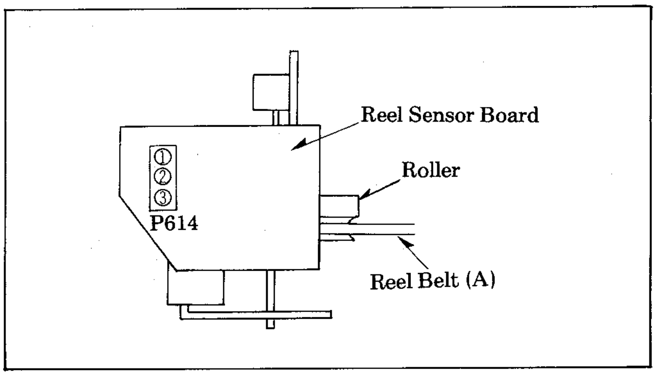

Reel Sensor Board
Roller
①
②
③
P614
Reel Belt (A)

Fig. 52

Counter Belts

- * Counter Belt B
  Check the belt if it has any cuts or scratches, and measure the length of belt.
  The correct one should be 80mm when the belt is formed as the Fig. 53. If the length is more than 83mm, replace it with new one.
- * Counter Belt A
  Check the belt and measure the length as the same way described above.
  The correct one should be about 115mm. If the length is more than 119mm, replace it with new one.

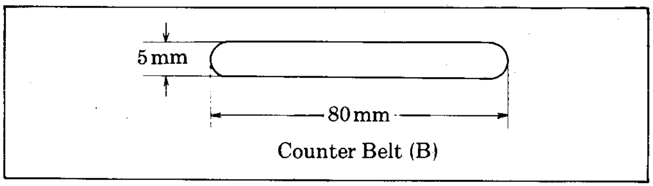

5mm
80mm
Counter Belt (B)

Fig. 53

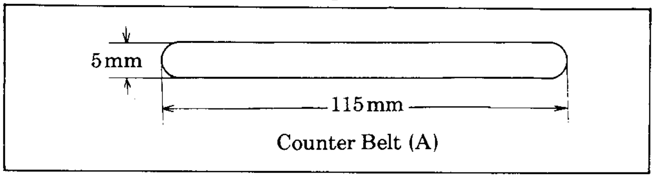

5mm
115mm
Counter Belt (A)

Fig. 54

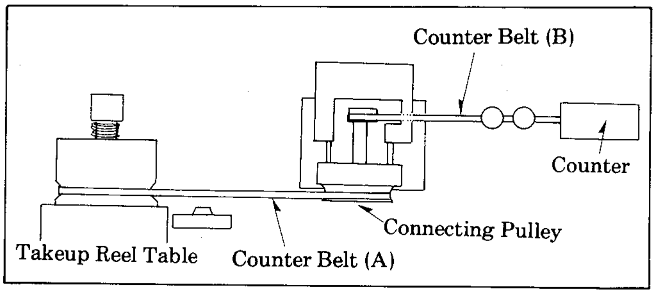

Counter Belt (B)
Counter
Connecting Pulley
Takeup Reel Table
Counter Belt (A)

Fig. 55

Reel Belt A & Reel Belt B

Check the belt and measure the length as the same way described above.
The correct length of each belt should be about 190mm. (Belt A) and 120mm. (Belt B). If the length are more than 196mm. (Belt A) and 124mm. (Belt B), replace then with new one.

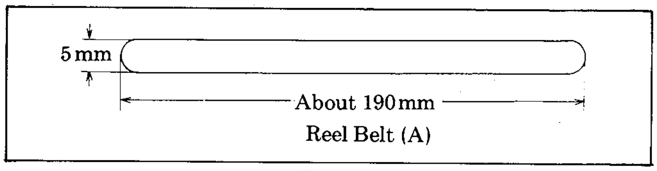

5mm
About 190mm
Reel Belt (A)

Fig. 56

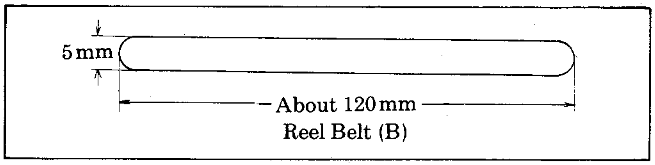

5mm
About 120mm
Reel Belt (B)

Fig. 57

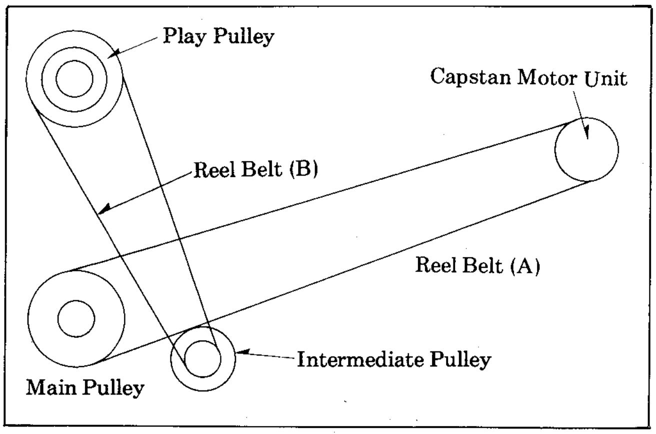

Play Pulley
Capstan Motor Unit
Reel Belt (B)
Reel Belt (A)
Intermediate Pulley
Main Pulley

Fig. 58

Capstan Belt

Check the belt and measure the length as the same way described above.
The correct one should be about 160mm. If the length is more than 165mm., replace it to new one.

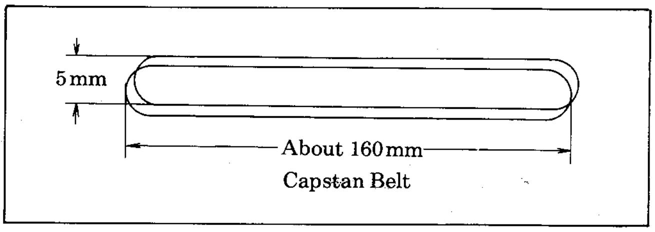

5mm
About 160mm
Capstan Belt

Fig. 59

Loading Belt

Check the belt if it has any cuts or scratches and also check strikingly damaged. If it is so, replace it to new one.

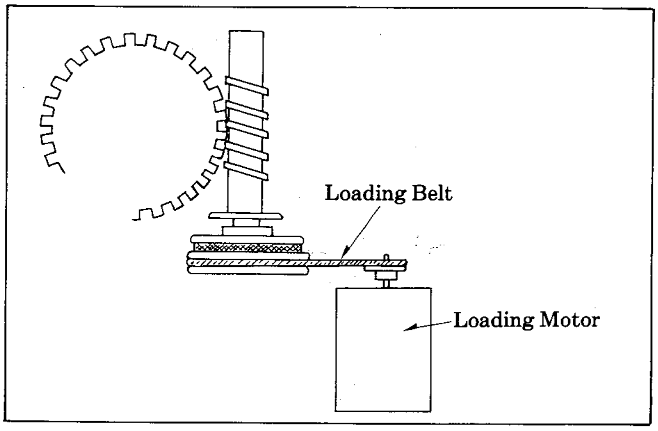

Loading Belt
Loading Motor

Fig. 60

F.F. Idler

Check the rubber portion of the idler if it is strikingly damaged, and deformed or not.
The correct form should be as the illustration shown in the Fig. 61.

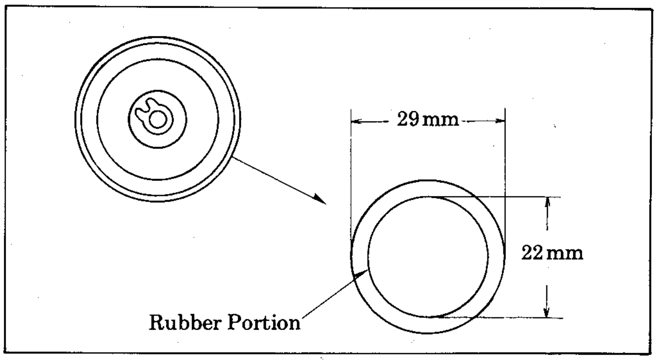

29mm
22mm
Rubber Portion

Fig. 61

Rewind Roller

Check the rubber portion of the idler if it is strikingly damaged, and deformed or not.
The correct form should be as the illustration shown in the Fig. 62.

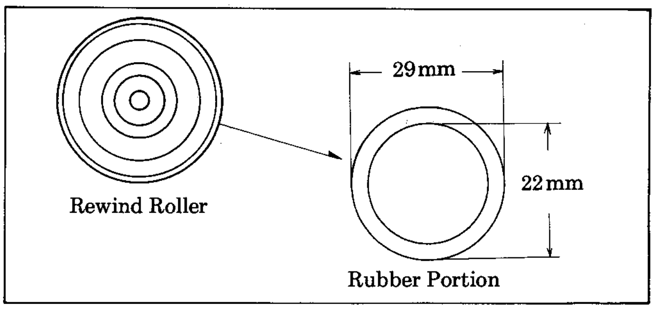

29mm
22mm
Rewind Roller
Rubber Portion

Fig. 62

Play Idler

Check the rubber portion of the idler if it is strikingly damaged, and deformed or not.
The correct form should be as the illustration shown in the Fig.63.

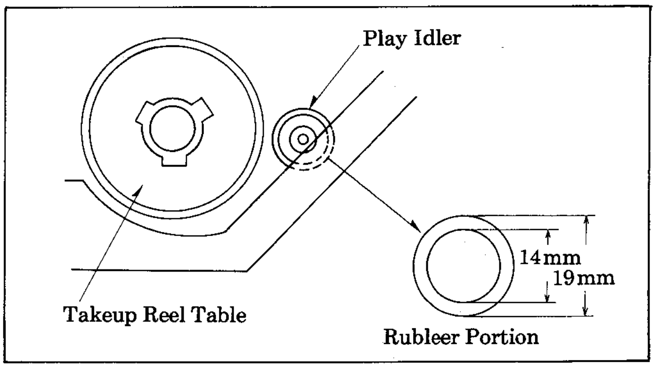

Play Idler
14mm
19mm
Takeup Reel Table
Rubleer Portion

Fig. 63

Loading Motor

1. Check the resistance of Loading Motor. The correct resistance should be 0 (zero)   . (Tester Range: ×1)
2. Check the current of Loading Motor as shown in Fig. 64.
   The correct current should be less than 300mA with the exception of the only case that the loading is completed.

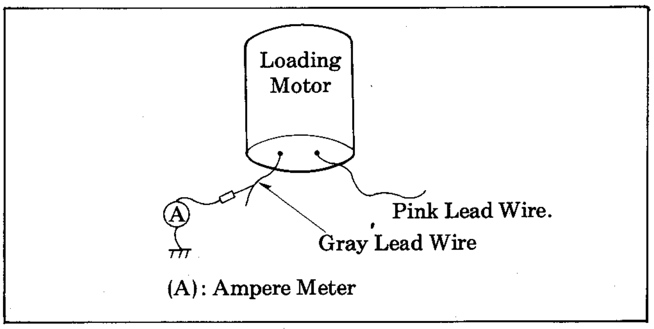

Loading Motor
A
Pink Lead Wire.
Gray Lead Wire
(A): Ampere Meter

Fig. 64

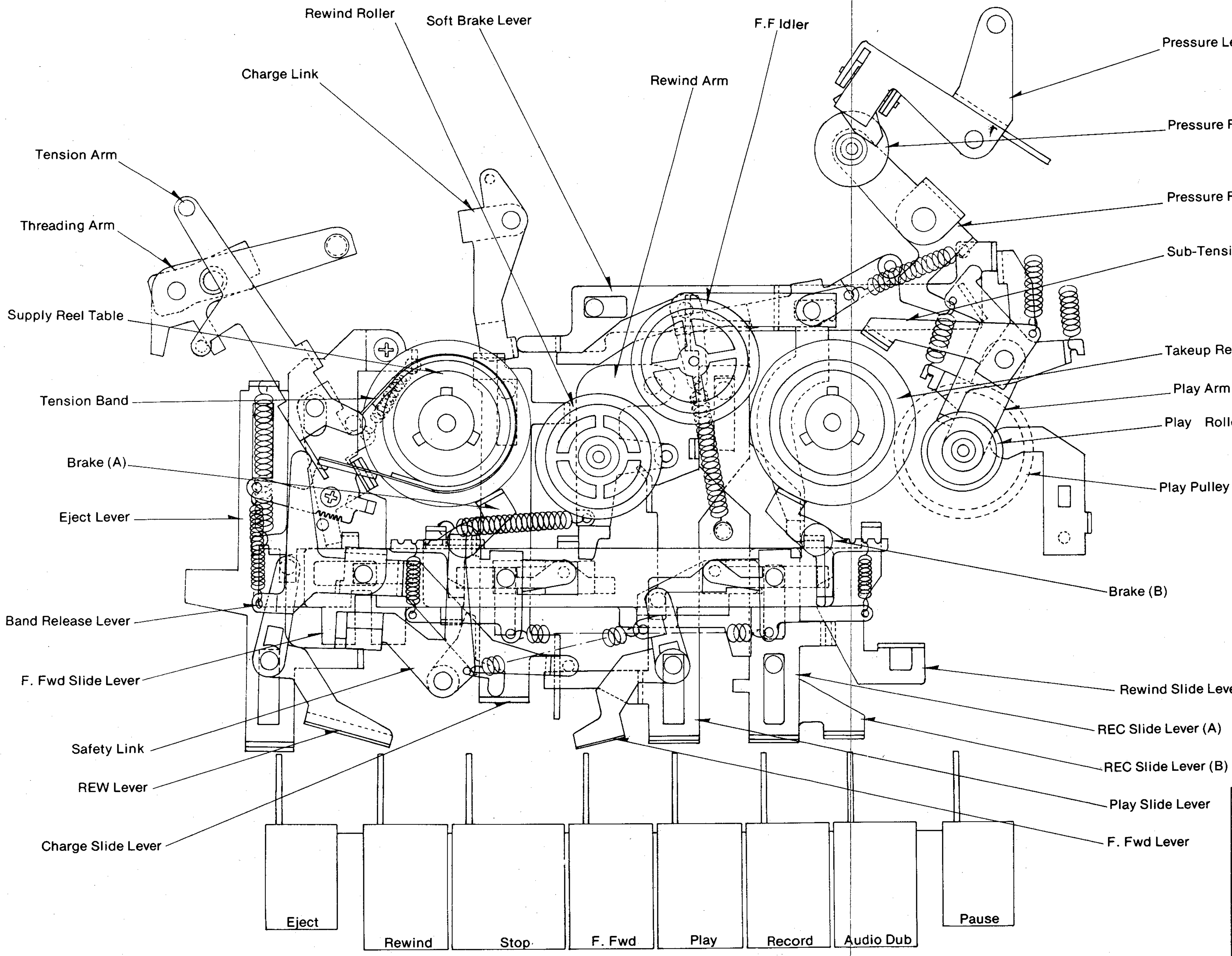
E. Technical Troubleshooting Guide (Circuitry)

Item	Symptom	Troubleshooting
E-1	TRANSPORT CIRCUIT Operation buttons are locked and impossible to press.	Check Q614→615→618 →D619→Q616→617 →D614→Q613→D611→Q612→D618 →Q611 →Q634 →Q626→627→628 →Q601→Q602
E-2	TRANSPORT CIRCUIT Abnormal Loading/Unloading	Check Q604→605→607 →Q610→609→608—606 →Q611→Counter Belt
E-3	TRANSPORT CIRCUIT Pressure Roller Solenoid doesn't work.	Check Q612→D612→611→613→624→623 →D625→D626→625 →Q621→622 →Q620→619
E-4	CYLINDER SERVO Excessive horizontal sway or no horizontal synchronization on a TV monitor.	A. Check TP206 (Sampling Pulse) & TP205 (Trapezoidal Wave)with a dual trace oscilloscope. If the sampling pulses donit lock on the trapezoidal wave, adjust R223 (CYLINDER FREE RUN) at first. (See electrical adjustment procedures) When you adjust R223, if the pulse don't lock on the trapezoid, check the Cylinder Servo circuit as follows. Check IC201(8)→IC201(14)→D207→Q213→Q212→D213→D212 B. If the sampling pulses don't appear at TP206, check the circuit as follows. Check TP204→IC201(24)(23)→Q211→Connector P24(1). C. If the trapezoidal wave dosen't appear at TP205, check the circuit as follows. REC Check IC201(25)→Q201→Connector P22(3) P.B IC201(26)→Connector P22(5)→Connector P32(2)→ IC805(5) (Chrominance Board)
E-5	CAPSTAN SERVO Periodic noise appears on a TV monitor.	A. Check TP216 (Sampling Pulse) & TP215 (Trapezoidal Wave) with a dual trace oscilloscope. If the sampling pulses don't lock on the trapezoidal wave, adjust R2116 (CAPSTAN FREE RUN) at first (See electrical adjustment procedures) When you adjust R2116, if the pulses don't lock on the trapezoid, check the Capstan Servo circuit as follows. Check Connector P21(2)→IC203(16)→IC203(7)→Q226→D224→ →Q227→D225→Q228 B. If the sampling pulse don't appear at TP216, check the circuit as follows. REC Check IC203(15)→IC215(3)→IC202(8)→IC206(6)→Q215→IC203(5) →IC203(16)→Connector P21(2) P.B →IC203(15)→IC201(2)→IC201(6)→Connector P23 (2).

Item	Symptom	Detailed Symptom Countermeasure
		C. If the trapezoidal wave doesn't appear at TP215 , check the circuit as follows. REC Check→IC203(15)→IC201(18)→IC201(25)→Q201→ →Connector P22 (3) P.B →IC203(15)→IC201(18)→IC201(26)→Connector P22(5)
E-6	VIDEO PROCESS Poor image in the playback mode. (Play back a recorded tape).	A. CHROMINANCE Check IC302(10)→Q327→FL306→Q316—JD(1)→ →* →IC801(13)→IC801(7)→Q801→Q805→Q806→FL802→ →Q809→Q804→IC801(15) →*** *→IC801(5)→FL803→IC802(12)→IC802(14)→IC803(4)→ →** →IC803(6)→IC802(17) **→IC802(15)→IC804(14) ***→IC801(9)→IC801(10)→Connector JD(4)→IC303(29) B. LUMINANCE Color Check IC302(10)→Q316→FL303→Q317→IC303(7)→IC303(16)→ B/W →IC303(9) Color →Q319→FL304→Q320→IC303(22)→IC303(24)→FL305→ →IC303(25)→IC303(2)→Q325→Q326→Q324
E-7	VIDEO PROCESS Pre-recorded tape playback is OK but poor image if recorded then the portion is played back.	B/W Color Check Connector P31(1)→FL301→IC301(1)→IC301(24)→FL302→ LP →IC301(21)→IC301(22)→IC301(19)→IC301(18)→Q301→Q302→ SP →IC301(16)→IC301(12)→Q305→Q304→IC301(19)→Q307→ →Q331→Q332→Q303 →Q308→Q309→Q310→Q311→Q312→Q313

Fig. 65

MECHANICAL FUNCTION CHARTS


Rewind Roller
Soft Brake Lever
Charge Link
F.F Idler
Rewind Arm
Tension Arm
Threading Arm
Supply Reel Table
Tension Band
Brake (A)
Eject Lever
Band Release Lever
F. Fwd Slide Lever
Safety Link
REW Lever
Charge Slide Lever
Pressure Lever (1)
Pressure Roller
Pressure Roller Arm (1)
Sub-Tension Arm (B)
Takeup Reel Table
Play Arm
Play Roller
Play Pulley
Brake (B)
Rewind Slide Lever
REC Slide Lever (A)
REC Slide Lever (B)
Play Slide Lever
F. Fwd Lever
Eject
Rewind
Stop
F. Fwd
Play
Record
Audio Dub
Pause

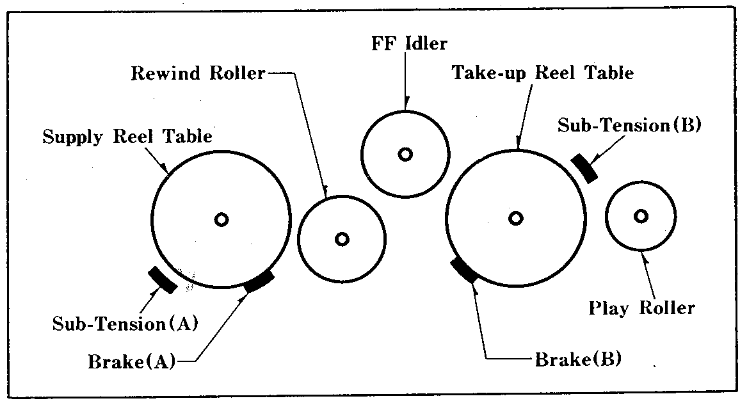
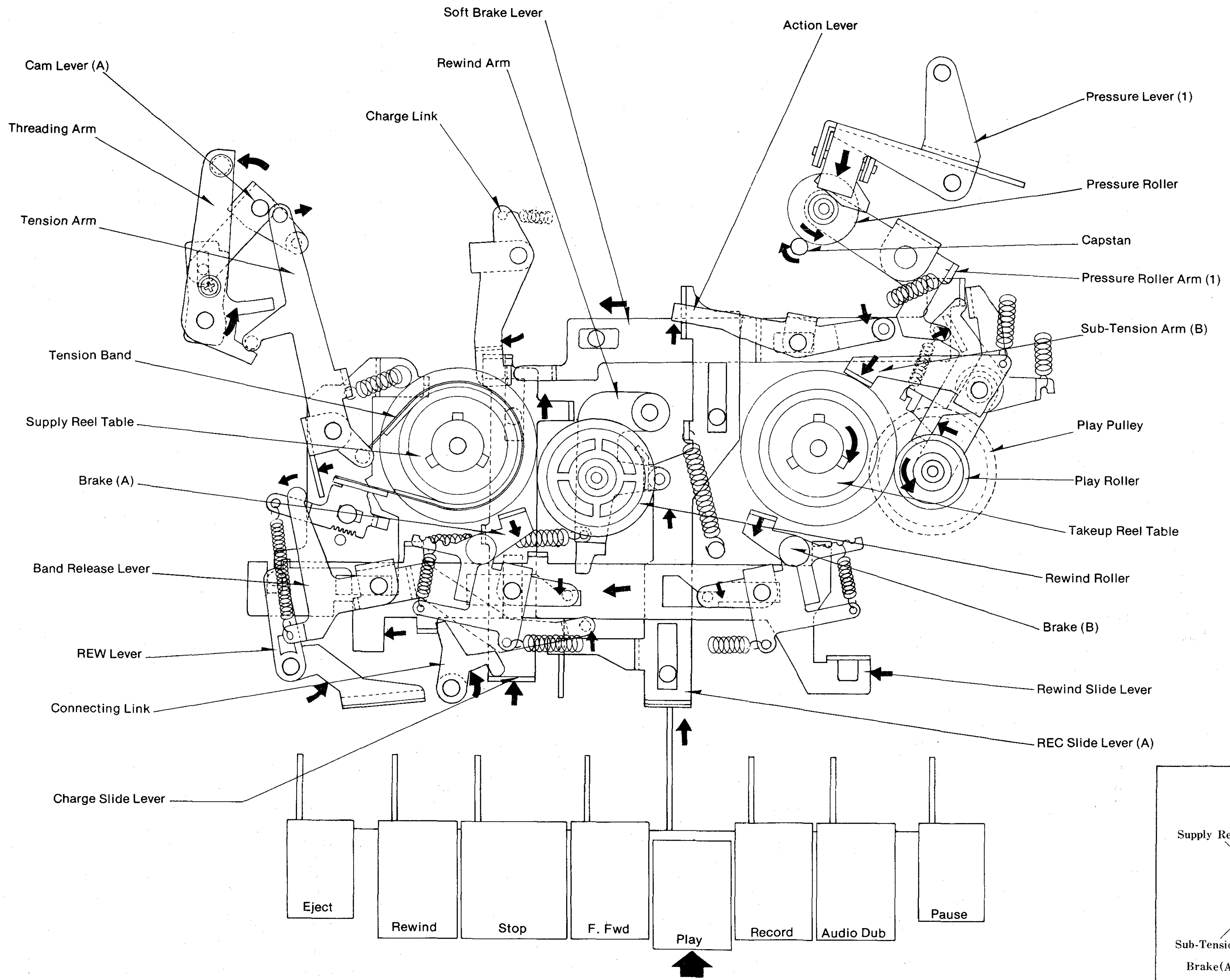

Rewind Roller
FF Idler
Take-up Reel Table
Supply Reel Table
Sub-Tension(B)
Play Roller
Sub-Tension(A)
Brake(A)
Brake(B)

Fig. 66 **STOP MODE**


Soft Brake Lever
Action Lever
Cam Lever (A)
Rewind Arm
Pressure Lever (1)
Charge Link
Threading Arm
Pressure Roller
Tension Arm
Capstan
Pressure Roller Arm (1)
Sub-Tension Arm (B)
Tension Band
Supply Reel Table
Play Pulley
Brake (A)
Play Roller
Takeup Reel Table
Band Release Lever
Rewind Roller
Brake (B)
REW Lever
Rewind Slide Lever
Connecting Link
REC Slide Lever (A)
Charge Slide Lever
Eject
Rewind
Stop
F. Fwd
Play
Record
Audio Dub
Pause

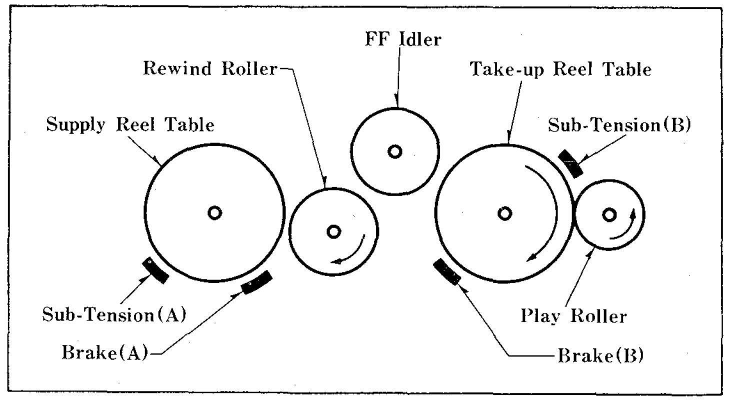

FF Idler
Rewind Roller
Take-up Reel Table
Supply Reel Table
Sub-Tension(B)
Sub-Tension(A)
Play Roller
Brake(A)
Brake(B)

Fig. 67 **PLAY MODE**

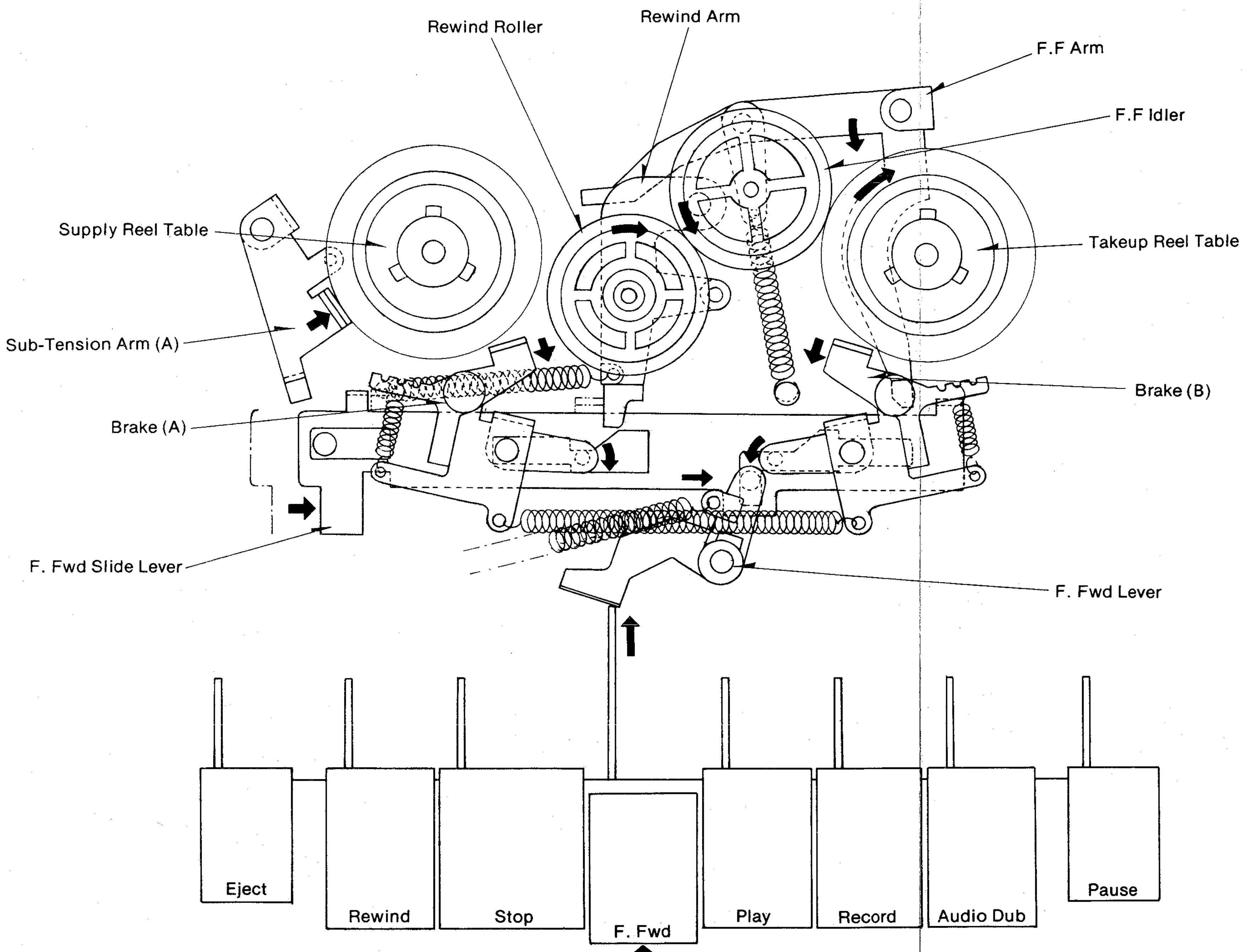
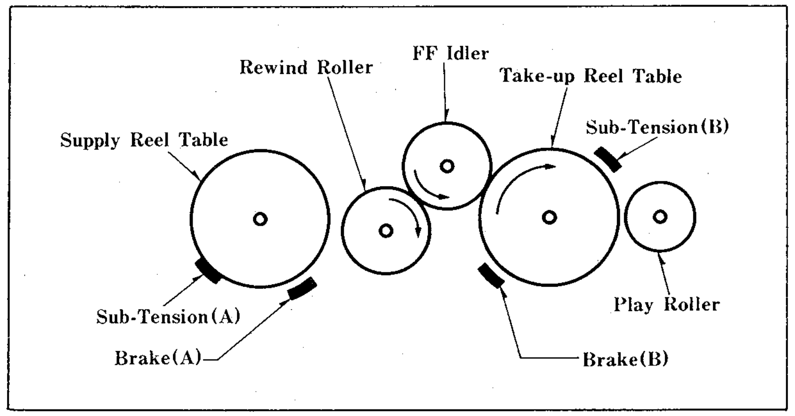

Rewind Roller
Rewind Arm
F.F Arm
F.F Idler
Supply Reel Table
Takeup Reel Table
Sub-Tension Arm (A)
Brake (B)
Brake (A)
F. Fwd Slide Lever
F. Fwd Lever
Eject
Rewind
Stop
F. Fwd
Play
Record
Audio Dub
Pause

Fig. 68 **F.FWD MODE**


Rewind Roller
FF Idler
Take-up Reel Table
Supply Reel Table
Sub-Tension(B)
Sub-Tension(A)
Play Roller
Brake(A)
Brake(B)

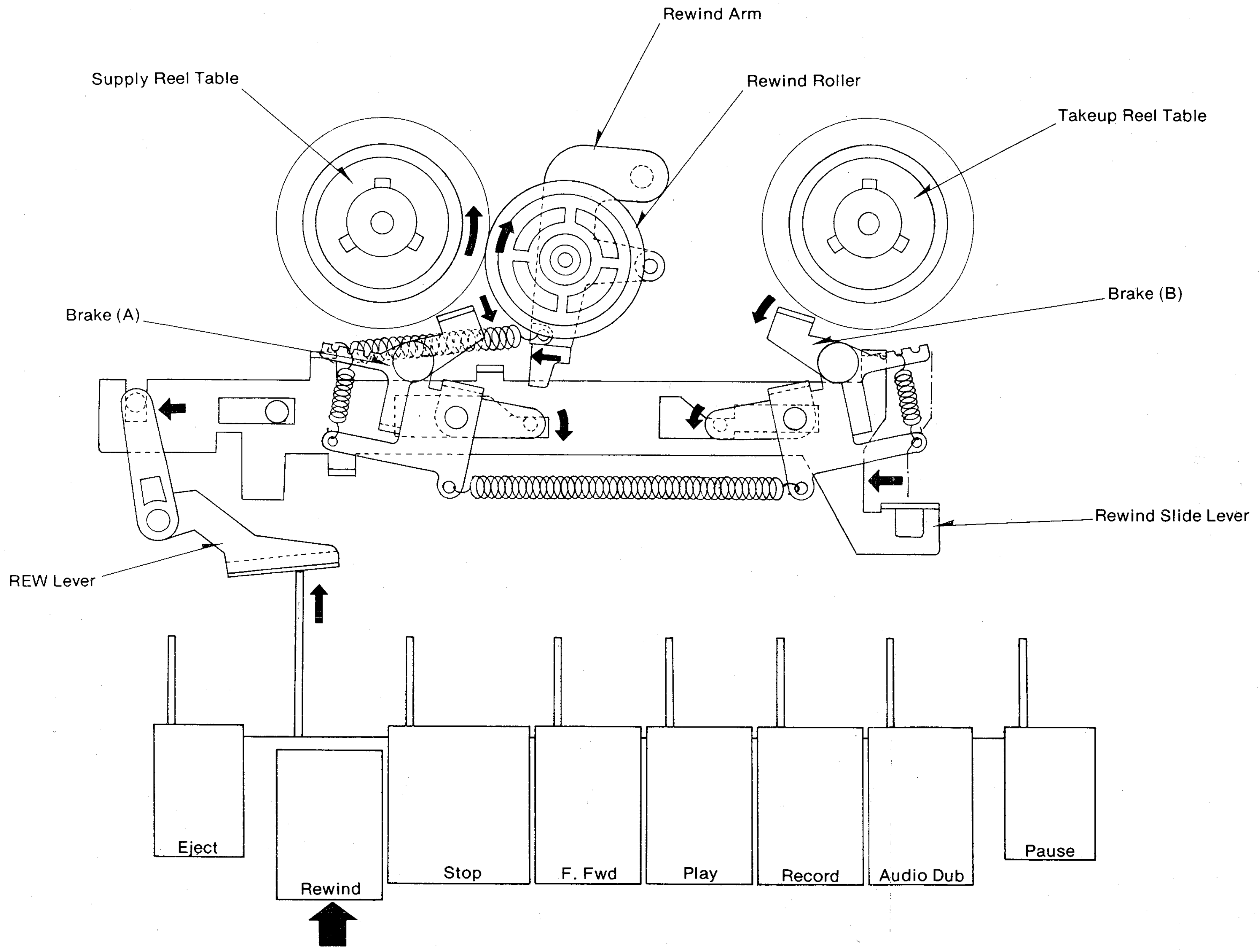
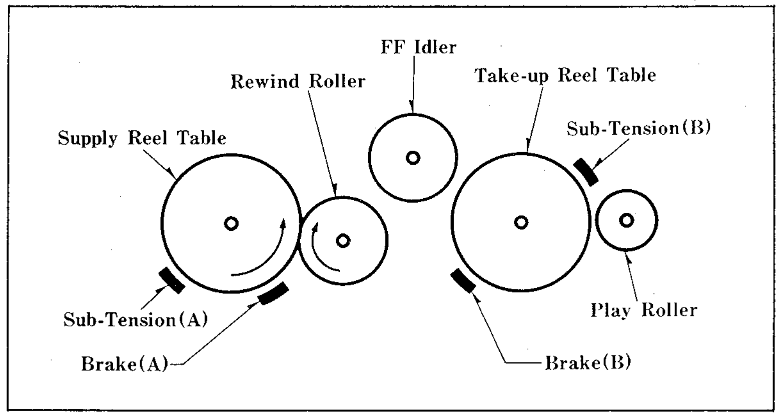

Rewind Arm
Supply Reel Table
Rewind Roller
Takeup Reel Table
Brake (B)
Brake (A)
Rewind Slide Lever
REW Lever
Eject
Rewind
Stop
F. Fwd
Play
Record
Audio Dub
Pause

Fig. 69 **REW MODE**


FF Idler
Rewind Roller
Take-up Reel Table
Supply Reel Table
Sub-Tension(B)
Sub-Tension(A)
Play Roller
Brake(A)
Brake(B)

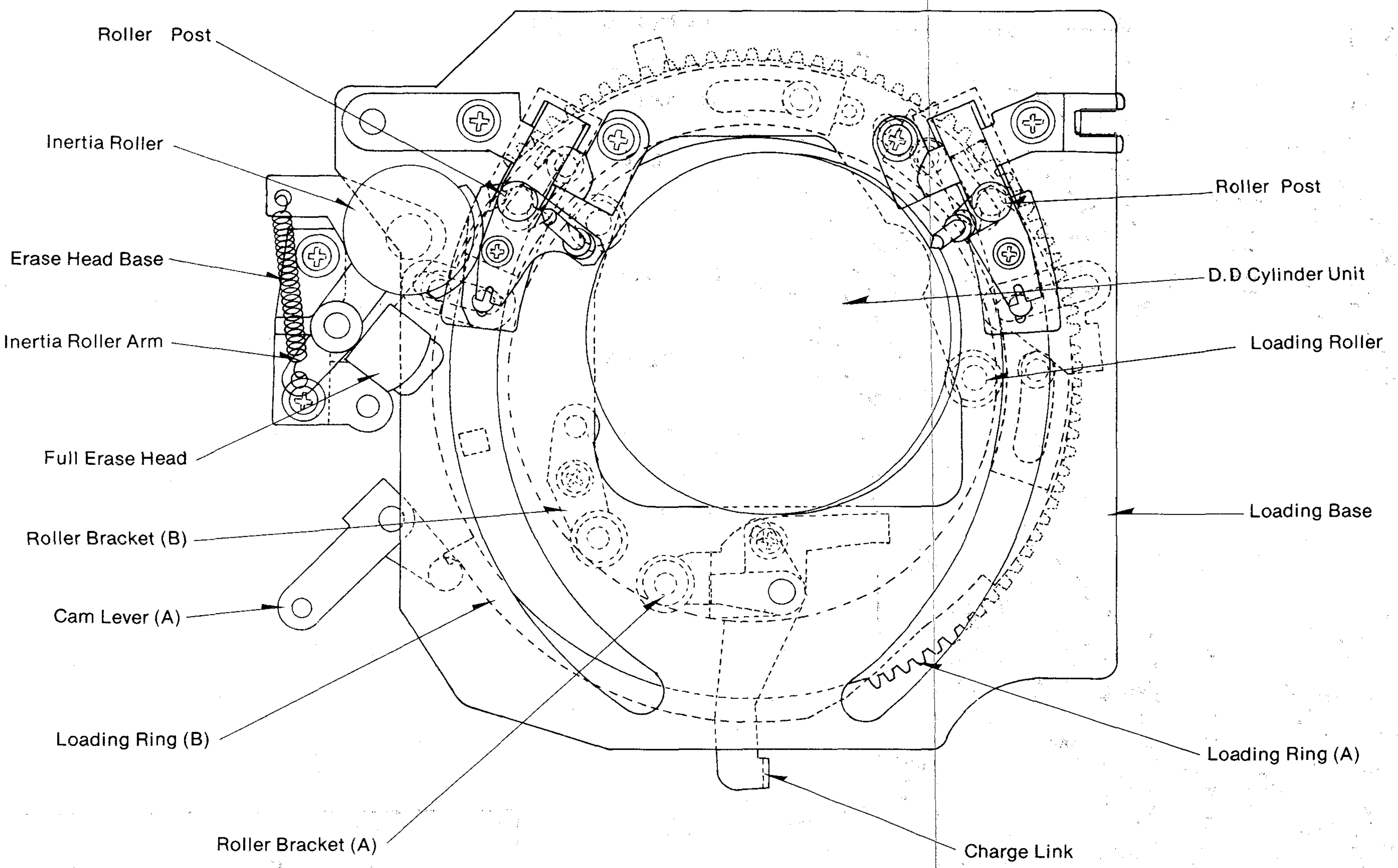
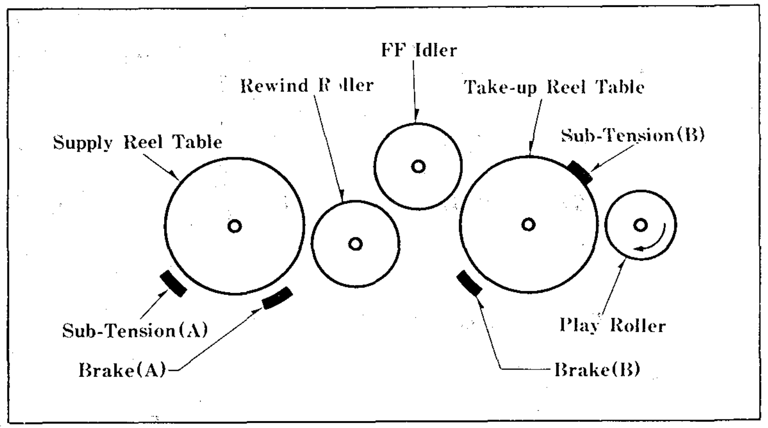
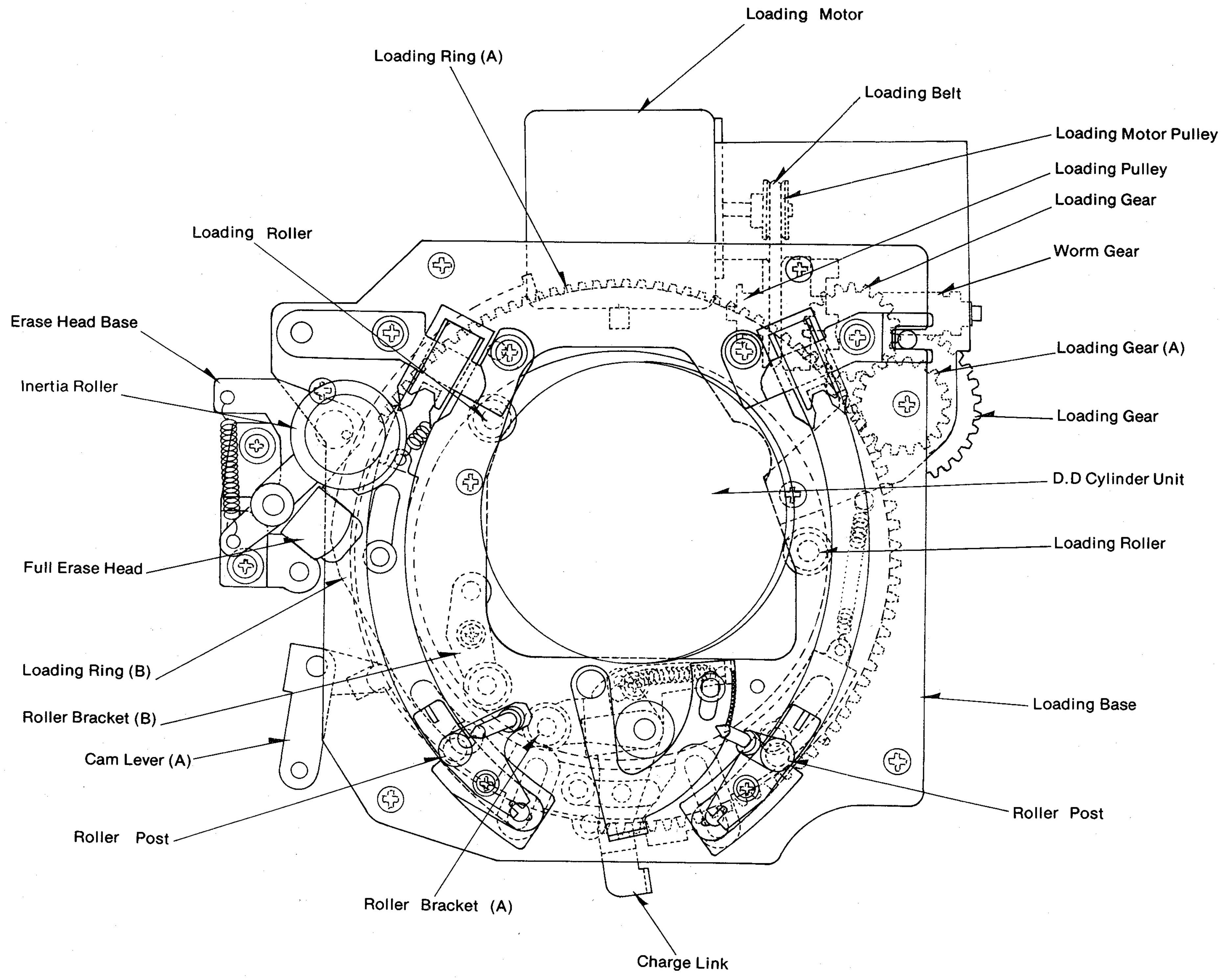

Roller Post
Inertia Roller
Erase Head Base
Inertia Roller Arm
Full Erase Head
Roller Bracket (B)
Cam Lever (A)
Loading Ring (B)
Roller Bracket (A)
Roller Post
D.D Cylinder Unit
Loading Roller
Loading Base
Loading Ring (A)
Charge Link

Fig. 70 **LOADING COMPLETION**


FF Idler
Rewind Roller
Take-up Reel Table
Supply Reel Table
Sub-Tension(B)
Sub-Tension(A)
Brake(A)
Play Roller
Brake(B)


Loading Motor
Loading Ring (A)
Loading Belt
Loading Motor Pulley
Loading Pulley
Loading Gear
Loading Roller
Worm Gear
Erase Head Base
Loading Gear (A)
Inertia Roller
Loading Gear
D.D Cylinder Unit
Loading Roller
Full Erase Head
Loading Ring (B)
Loading Base
Roller Bracket (B)
Cam Lever (A)
Roller Post
Roller Post
Roller Bracket (A)
Charge Link

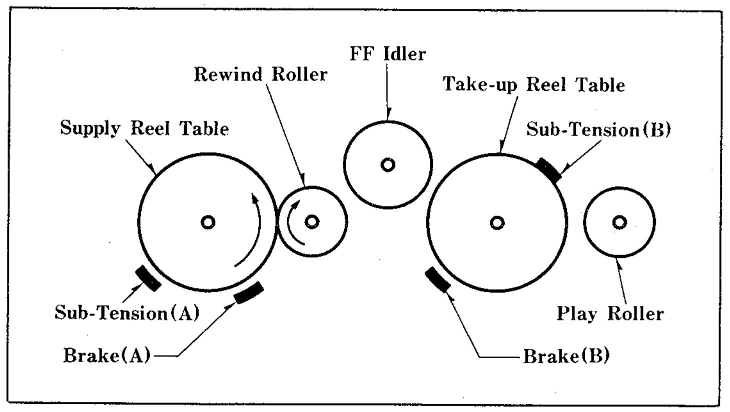

FF Idler
Rewind Roller
Take-up Reel Table
Supply Reel Table
Sub-Tension(B)
Sub-Tension(A)
Play Roller
Brake(A)
Brake(B)

Fig. 71 **UNLOADING COMPLETION**

ELECTRICAL ADJUSTMENT PROCEDURES

This section provides complete electrical adjustment procedures which may be required for electronic circuits of 2/4 hour selectable VHS video cassette recorder.

1. *Test Equipment*

To make adjustments completely, following equipment is required.

1. VTVM (Vacuum Tube Volt Meter)
   Voltage Range: 0.001—50V
2. Dual-trace Oscilloscope
   Voltage Range: 0.005—50V/div
   Frequency Range: DC—10MHz
   Probes: 10 : 1 and 1 : 1
3. Frequency Counter
   Frequency Range: 0—10MHz
4. Signal Generator
   Sinewave: 0—10MHz
5. Color Receiver or Monitor
6. Plastic Tip Driver
7. VHS Alignment Tape See Note 1.
   VFM8080H4

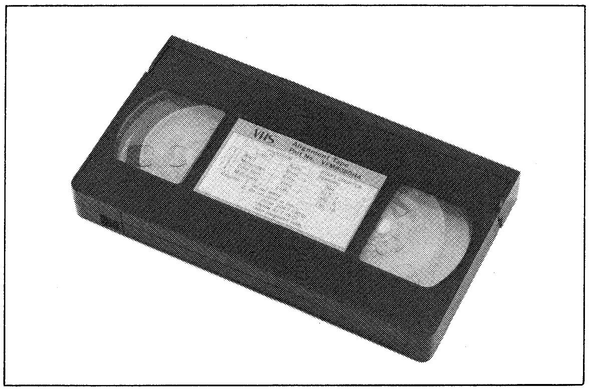


Fig. E1 VHS Alignment Tape VFM8080H4

8. Sweep Generator See Note 2.
   Frequency Range: 0—10MHz
9. Vector Scope See Note 2.

Notes: 1. The VHS alignment Tape VFM8080H4 contains the following signals.

Start Counter Reading (Large Hub) (Small Hub)	0 0	017±4 039±4	092±6 128±6	130±10 240±10
Video	Blank	Monoscope	Color Bars	Multi-Burst
Audio	Blank	6KHz	3KHz	1KHz

Fig. E2 Programs in the Alignment Tape

2. In this adjustment procedures, these two instruments are used for factory level adjustments. For field adjustments, simplified methods are shown at the same time.

2. *Adjustment Procedures*

This adjustment procedures consist of the following sections.

1. Power Supply and Transport Section
2. Servo Section
3. Audio Section
4. Video Section

2-1. POWER SUPPLY AND TRANSPORT SECTION

Before adjusting the Power Supply circuit, be sure to check the AC input voltage 120V AC.

Connect a video signal to the video input on the rear panel or tune in a local on-air TV program, insert a cassette tape, lower the cassette compartment and make a recording.

If no power, check the timer switch on the built-in timer first (if the switch is set to "ON" position, no power is supplied to the unit, even though the power switch is pressed (ON).

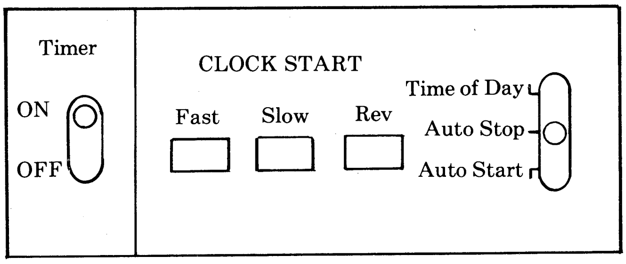
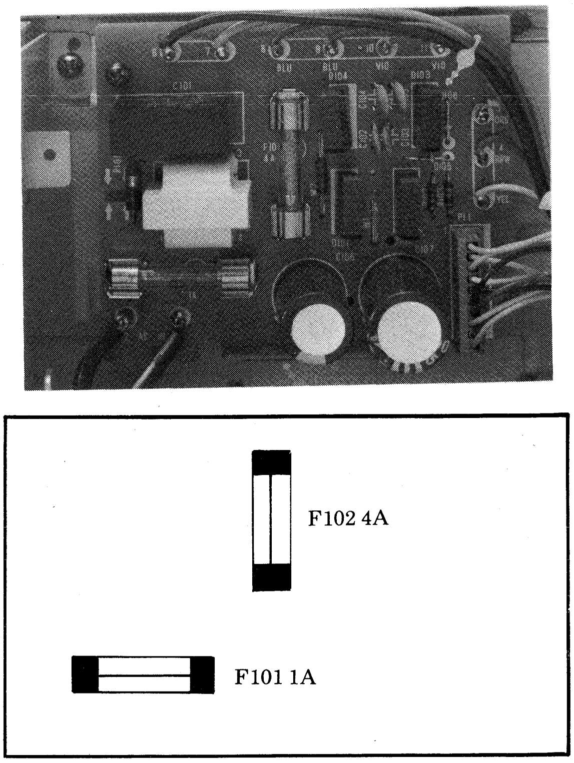


Fig. E3

If no power or no tape movement, regardless of time switch position check the two fuses on the Power Supply board.



Fuses on the Power Supply Board (From components side)

Fig. E4

Then, proceed with the following confirmations and adjustment. All controls and test points are located on the Regulator and Transport board.

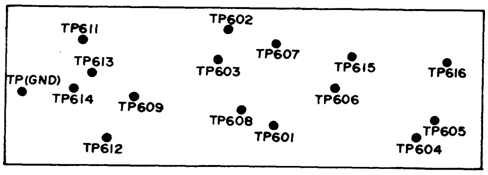

TP611
TP602
TP613
TP607
TP603
TP615
TP616
TP(GND)
TP614
TP609
TP606
TP608
TP601
TP605
TP612
TP604

Fig. E5

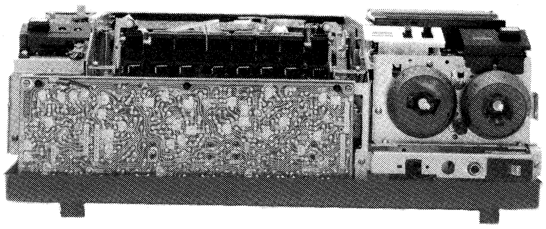


Fig. E6

2-1-1. Unreg +19 V DC Confirmation

Test Point: Pin 3 of Connector P62

1. Connect the VTVM to pin 3 of connector P62 (use the VDC range of VTVM).
   Be careful not to touch other pins. Never short between pin 3 and 4.
2. Confirm that the voltage is 19±3 V DC.

2-1-2. Unreg +18 V DC Confirmation

Test Point: Pin 8 of Connector P62

1. Connect the VTVM to pin 8 of connector P62. Be careful not to touch other pins.
2. Confirm that the voltage is 18.0±3 V DC.

2-1-3. DC +12 V Adjustment

Test Point: TP612

Adjustment: +12 V ADJ (R693)

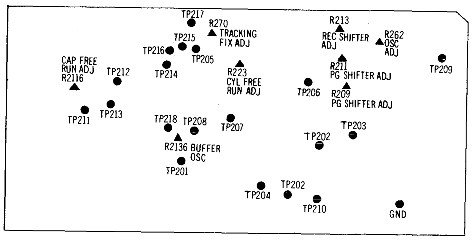
1. Connect the VTVM to TP612.
2. Adjust the +12 V ADJ (R693) for 12.0±0.1 V DC.

2-2. SERVO SECTION

When you perform the following servo adjustments be sure to set the unit vertically as shown in Fig. E8 (tuner section should be upward).

Servo adjustment procedure consists of two parts.

A. Adjustment in the Stop or Playback modes.
B. Adjustment in the Record mode.


TP217
R270
TRACKING FIX ADJ
TP215
TP216
TP205
R213
REC SHIFTER ADJ
R262
OSC ADJ
CAP FREE RUN ADJ
R2116
TP212
TP214
R223
CYL FREE RUN ADJ
R211
PG SHIFTER ADJ
TP209
TP206
R209
PG SHIFTER ADJ
TP211
TP213
TP218
TP208
TP207
TP203
TP202
R2136 BUFFER OSC
TP201
TP204
TP202
TP210
GND

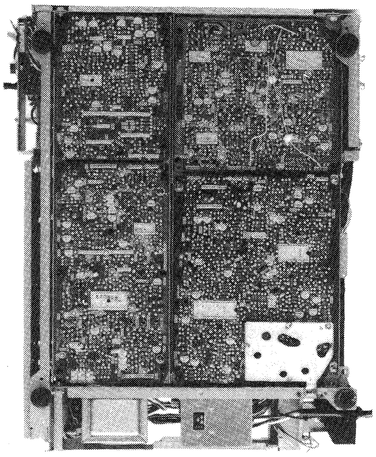


Fig. E8

A. ADJUSTMENTS IN THE STOP OR PLAYBACK MODES

2-2-1. 60 Hz Oscillation Confirmation

Test Point: TP202

1. Place the unit in the play mode.
2. Connect the scope to TP202 on the Servo board.
3. Confirm that the T portion of waveform becomes 16.6 msec.
4. If not, be sure item 2-4-9 is adjusted correctly.

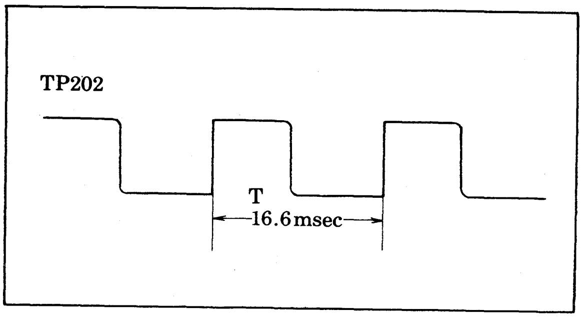

TP202
T
16.6 msec

Fig. E9 60 Hz Square Waveform

2-2-2. Switching Flip-Flop Duty Cycle Adjustment

Test Points: TP309, TP311, TP312, TP314

Adjustments: R209 (PG SHIFTER ADJ)
R211 (PG SHIFTER ADJ)

1. Connect the jumper between TP309 and TP311 on the Luminance board.
2. Connect the scope CH1 to TP312 and CH2 to TP314 on the same board. Use TP202 for trigger of scope.

3. Play back the monoscope section of alignment tape VFM8080H4 and set the scope to the CHOP mode. Then expand the switching portion of the envelope.

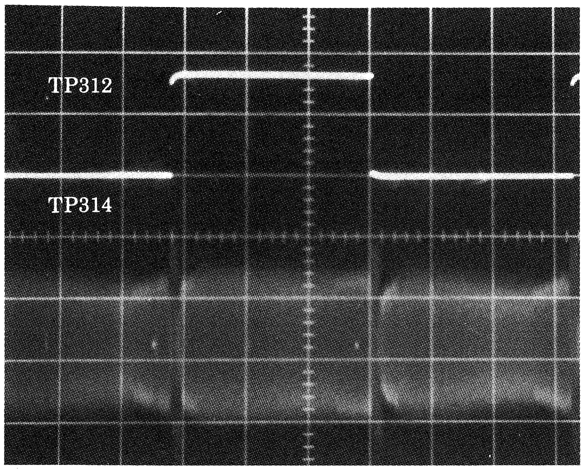

TP312
TP314

Fig. E10

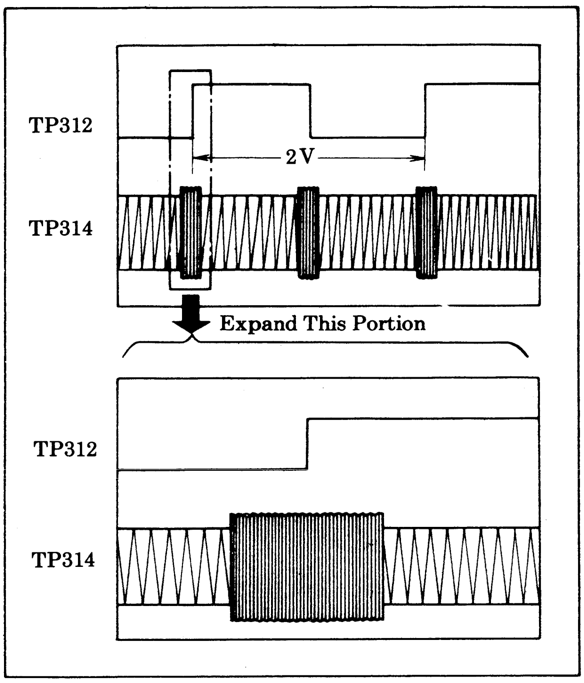

TP312
2V
TP314
Expand This Portion
TP312
TP314

Fig. E11 Relationship between Head Switch Pulse and RF Envelope

4. Now adjust PG SHIFTER ADJ (R211) on the Servo board to place the rising edge of the Switching pulse in the center of the overlapped RF envelope.

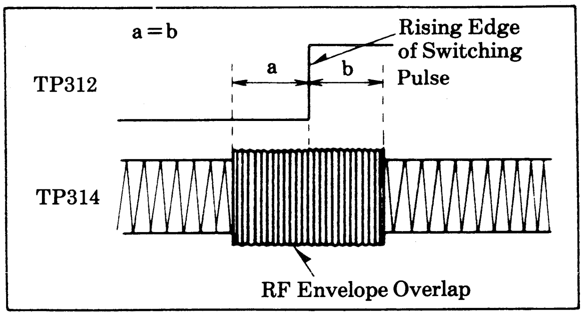

a=b
Rising Edge of Switching Pulse
a
b
TP312
TP314
RF Envelope Overlap

Fig. E12 Switching Position

5. Then adjust PG SHIFTER ADJ (R209) on the Servo board to place the falling edge of the switching pulse in the center of the overlapped of RF envelope.

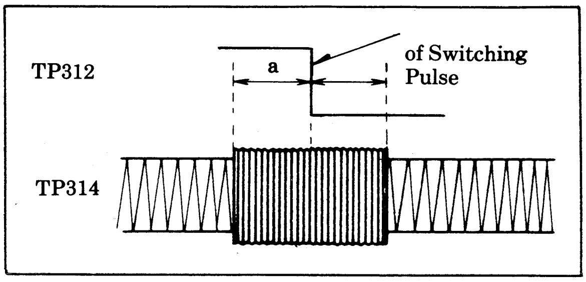

TP312
a
of Switching Pulse
TP314

Fig. E13 Switching Position

6. Remove the jumper.

2-2-3. Control Head Output Confirmation

Test Point: TP208

1. Connect the scope to TP208 on the Servo board.
2. Play back the monoscope section of the alignment tape VFM8080H4.
3. Make sure that the level of positive pulses is more than 1.2V.

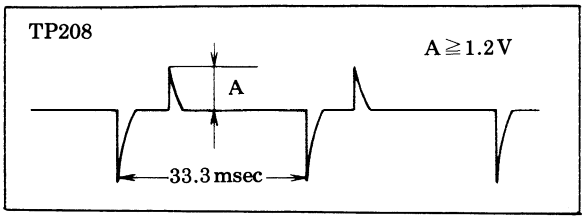

TP208
A≧1.2V
A
33.3msec

Fig. E14 Control Head Output

2-2-4. Tracking Fix Adjustment

Test Points: TP204, TP214

Adjustment: R270 (TRACKING FIX ADJ)

1. Supply a video signal to the Video Input on the rear panel or tune in a local on-air TV program.
2. Insert a cassette and make a recording in the SP mode for a few minutes.
3. Set the Tracking Control on the top panel to the center detent position. Connect the scope CH1 to TP204 and CH2 to TP214 on the Servo board and expand sweep. Use TP202 for trigger of the scope.
4. Play back the portion just recorded.
5. During playback, adjust the TRACKING FIX ADJ (R270), so the phase relationship between TP204 and TP214 are as shown in Fig. E15.

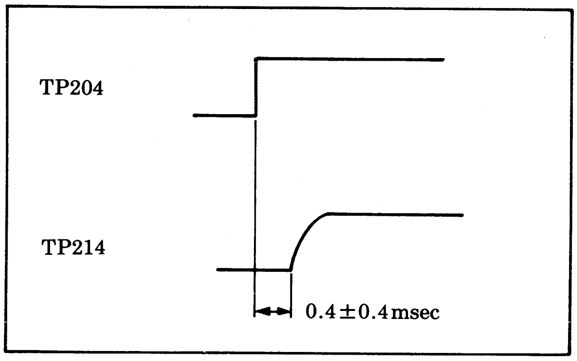

TP204
TP214
0.4±0.4msec

Fig. E15 Phase Relationship Between TP204 and TP214

2-2-5. P.G. Head Output Confirmation

Test Point: TP203

1. Play back the monoscope section of alignment tape VFM8080H4.
2. Connect the scope to TP203.
3. Confirm that the levels are as shown in Fig. E16.

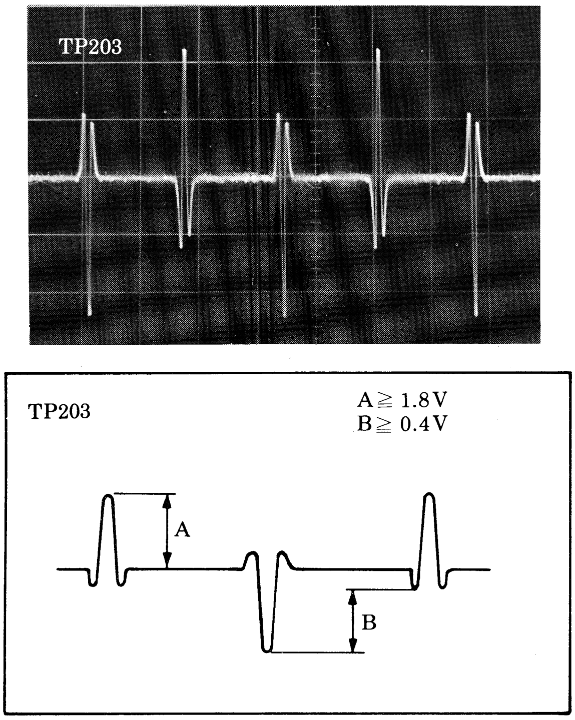


Fig. E16 P.G. Head Output

2-2-6. Oscillation Amplitude Adjustment

Test Point: TP209

Adjustment: R262 (OSC LEVEL ADJ)

1. Supply a video signal to the Video Input on the rear panel or tune in a local on-air TV program.
2. Place the unit in PLAY mode.
3. Connect the scope to TP209
4. Adjust the OSC LEVEL ADJ (R262) on the same board so the A portion of the waveform is 0.33 ±0.02 Vp-p.

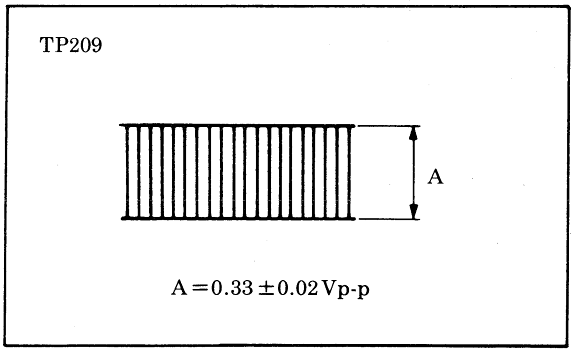


Fig. E17 Waveform at TP209

B. ADJUSTMENTS IN THE RECORD MODE

2-2-7. Capstan FG Output Confirmation

Test Point: TP213

1. Supply a video signal to the Video Input on the rear panel or tune in a local on-air TV program.
2. Place the unit in LP RECORD mode and make a recording.
3. Connect the scope to TP213.
4. Confirm that the level **is greater than 180 mVp-p.**

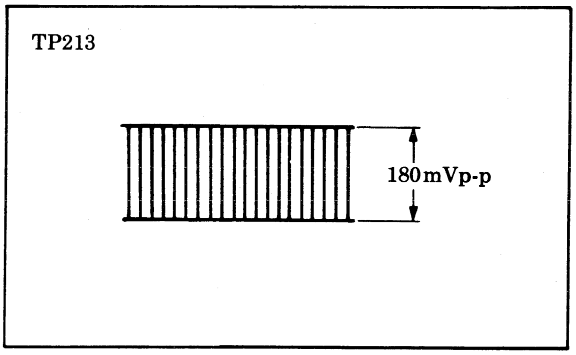


Fig. E18 Capstan FG Output

2-2-8. Buffer OSC Frequency Adjustment

Test Point: TP218

Adjustment: R2136 (BUFFER OSC)

1. Don't supply any video signal nor RF signal to the rear panel.
2. Connect the scope to TP218 on the Servo board.
3. Place the unit in the RECORD mode and adjust the BUFFER OSC (R2136) so that the "T" is 17.5 ±0.25msec.

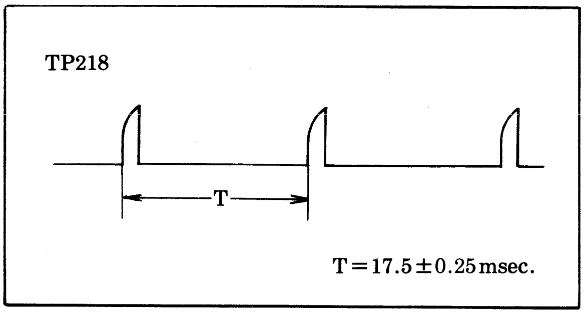


Fig. E19 Buffer OSC Frequency

4. Supply a video signal to Video Input on the rear panel or tune in a local on-air TV program.
5. Confirm that the "T" is 16.6 msec.

2-2-9. Cylinder Servo Sampling Gate Adjustment

Test Points: TP205, TP204, TP206
Adjustment: R223 (CYLINDER FREE RUN ADJ)

1. Supply a video signal to the Video Input on the rear panel or tune in a local on-air TV program.
2. Insert a cassette and make a recording.
3. Connect the scope CH1 to TP205 and CH2 to TP204 on the Servo board.
   Set the scope to the CHOP mode.
4. Pre-adjust the CYLINDER FREE RUN ADJ (R223) on the same board so the two waveforms are locked.

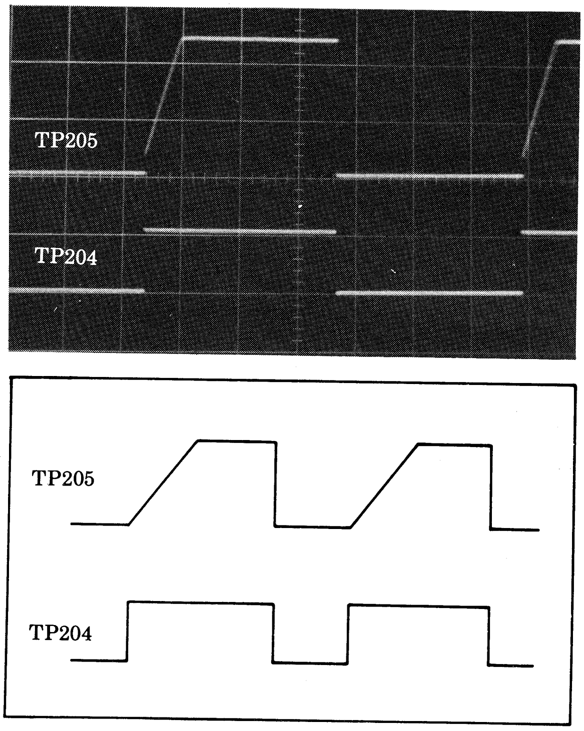


Fig. E20 Cylinder Servo Sampling Gate

5. Connect the VTVM to TP206 on the same board.
6. Adjust the CYLINDER FREE RUN ADJ (R223) so the voltage is 5±0.2 V DC.

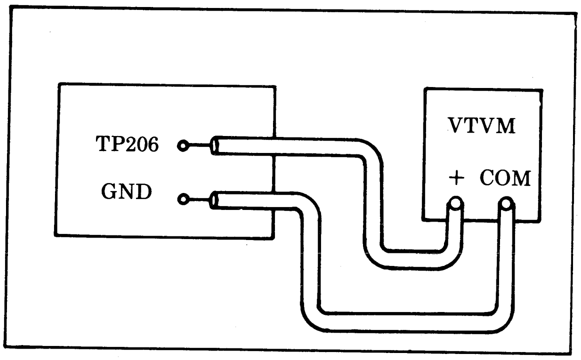


Fig. E21

2-2-10. Capstan Servo Sampling Gate Adjustment

Test Points: TP215, TP216, TP217
Adjustment: R2116 (CAP FREE RUN ADJ)

1. Supply a video signal to Video Input on the rear panel or tune in a local on-air TV program.
2. Place the unit in SP RECORD mode and make a recording.
3. Connect the scope CH1 to TP215 and CH2 to TP216.
   Set the scope to the ADD mode.
4. Pre-adjust the CAP FREE RUN ADJ (R2116) on the same board so the sampling pulses are locked on the rising slope of trapezoidal waveform.

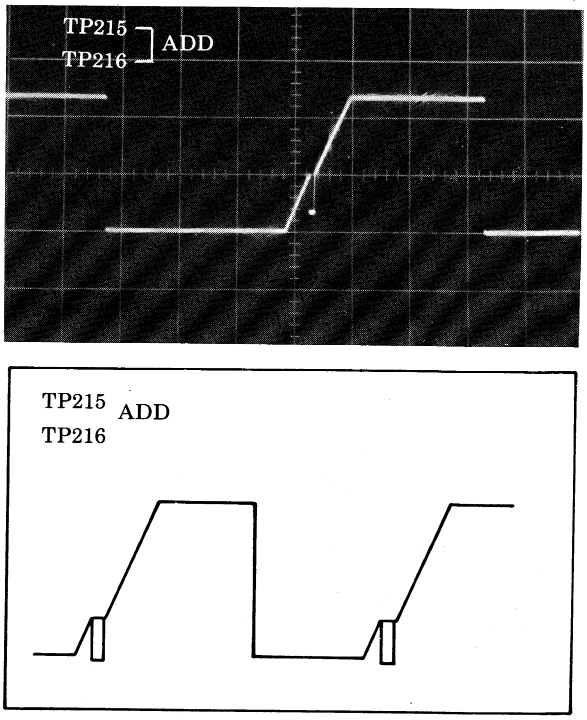


Fig. E22 Capstan Servo Sampling Gate

5. Connect the VTVM to TP217 on the same board.

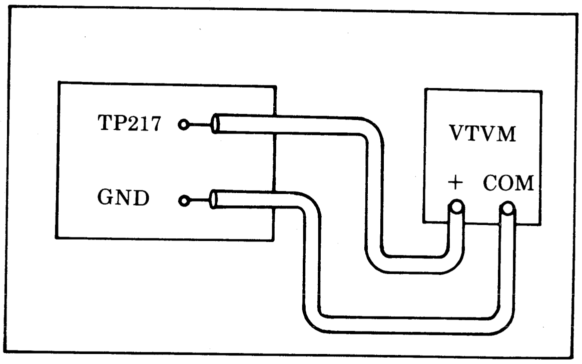


Fig. E23

6. Adjust the CAP FREE RUN (R2116) so the voltage is 5±0.2V DC.
7. Then switch to LP mode. Confirm that the variation of voltage is less than ±0.3V DC.

2-2-11. Head Switching Position Adjustment

Test Points: TP204, TP301

Adjustment: R213 (REC SHIFTER ADJ)

1. Supply a video signal to the Video Input on the rear panel or tune in a local on-air TV program.
2. Insert a cassette and make a recording.
3. Connect the scope CH1 to TP204 and CH2 to TP301 on the Luminance board.
   Set the scope to CHOP mode.
4. Also set the scope to the Delay mode or expand the vertical interval of the signal from TP301.
5. While the recording, adjust the REC SHIFTER (R213) so the recording head switching point is 6±1H before the start of vertical sync as shown in Fig. E24.

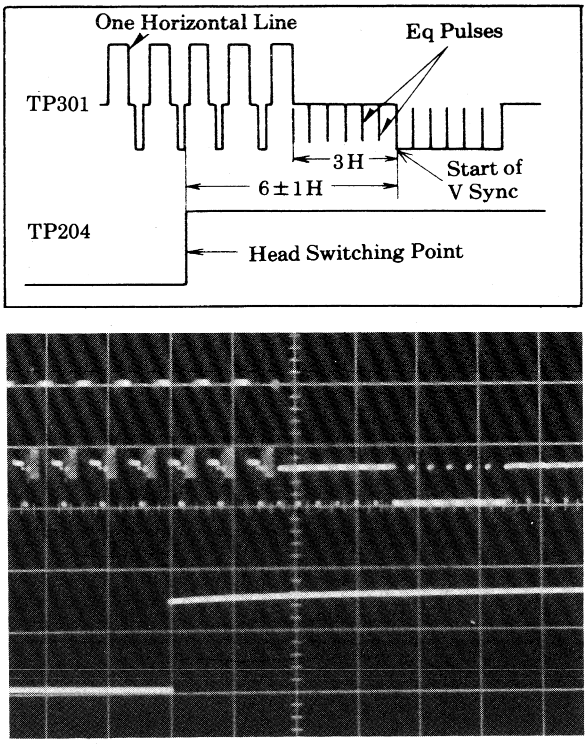

One Horizontal Line
Eq Pulses
TP301
3H
6±1H
Start of V Sync
TP204
Head Switching Point

Fig. E24

6. Change the slope of scope from "+" to "−" and make sure that the other switching point is also 6±1H before the beginning of vertical sync. If more or less than 6±1H, readjust the switching Flip-Flop Duty Cycle (Refer to item 2-2-2).

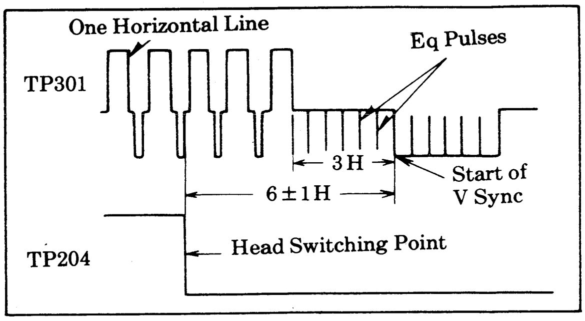

One Horizontal Line
Eq Pulses
TP301
3H
6±1H
Start of V Sync
TP204
Head Switching Point

Fig. E25 Head Switching Point-2

2-2-12. Control Duty Adjustment

Test Point: TP207

Adjustment: R204 (CTL DUTY ADJ)

1. Supply a video signal to Video Input on the rear panel or tune in a local on-air TV program.
2. Insert a cassette and make a Recording.
3. Connect the scope to TP207.
4. Adjust the CTL DUTY ADJ (R204) so the waveform at TP207 is as shown in Fig. E26.

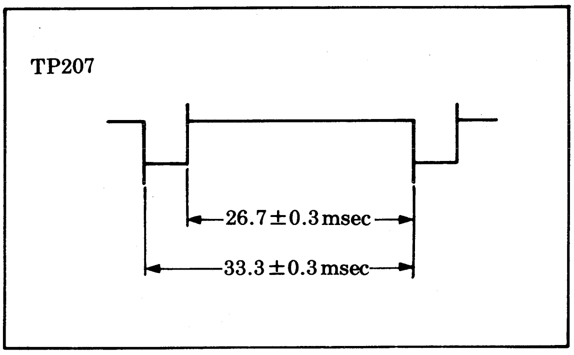

TP207
26.7±0.3msec
33.3±0.3msec

Fig. E26 Recording Control Pulse

2-2-13. LP/SP Voltage Confirmation

Test Point: TP211

1. Supply a video signal to Video Input on the rear panel or tune in a local on-air TV program.
2. Insert a cassette and make a recording in the SP mode for a few minutes.
3. Play back the portion just recorded.
4. Connect the VTVM to TP211.
5. Confirm that the voltage is 5.6±0.7V DC.

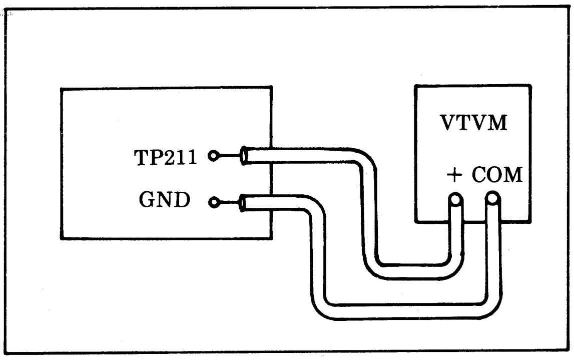

TP211
GND
VTVM
+ COM

Fig. E27

2-2-14. LP/SP Switching Confirmation

Test Point: TP212

1. Supply a video signal to Video Input on the rear panel or tune in local on-air TV program.
2. Insert a cassette and make a recording in the LP mode for a few minutes.
   Then switch to SP mode and make a recording for a few minutes.
3. Play back the portion just recorded.
4. Connect the VTVM to TP212 so the voltage is as follows.
   LP mode→H
   SP mode→L

2-3. AUDIO SECTION

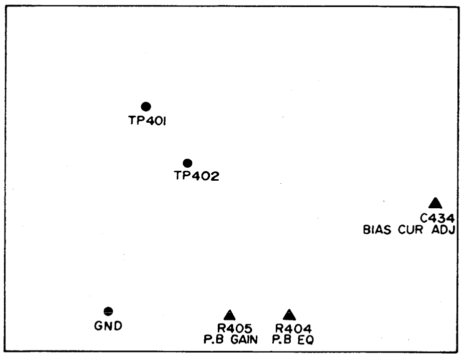


Fig. E28

Audio adjustment procedures consist of two parts.
A. Adjustments in the Record mode.
B. Adjustment in Playback mode.

A. ADJUSTMENT IN RECORD MODE.

2-3-1. AGC Confirmation

Test Point: TP401

1. Supply a sinewave signal (1kHz—20dB) to the Audio Input on the rear panel and the Input Selector on the front panel to the CAMERA position.
2. Insert a cassette and make a recording in the SP mode.
3. Connect the scope to TP401 on the Audio board.
4. Confirm that the audio level is 1.3±0.2Vp-p.
5. Change the input signal level from −20dB to 10dB and confirm the audio output level is still 1.3±0.2Vp-p.

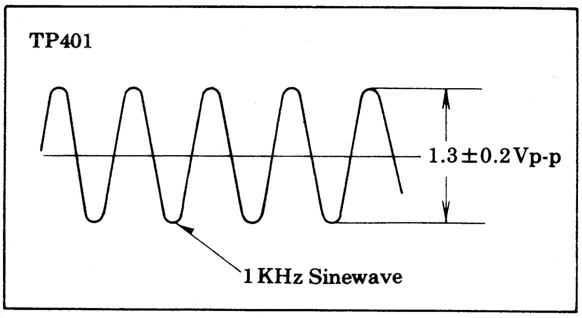


Fig. E29 Waveform at TP401

2-3-2. Bias Current/Dummy Coil Adjustments

A. Bias Current Adjustment

Test Point: Audio Head Terminal
Adjustment: C434 (BIAS CUR ADJ)

1. Do not connect any audio signal to the Audio Input on the rear panel and set the Input Selector on the front panel to the CAMERA position.
2. Insert a cassette and make a recording in the SP mode.
3. Connect the VTVM as shown in Fig. E29.

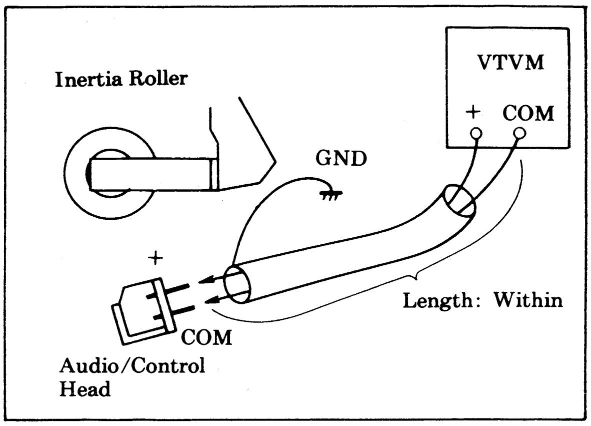


Fig. E30

4. While the recording is taking place, adjust the BIAS CUR ADJ (C434) on the Audio board as follows. (Since there are three kinds of audio heads, be sure to check the marking on the head which is used in the unit you are repairing).
   Marked in Green 1.00±0.05mV
   Marked in Yellow 1.20±0.05mV
   Marked in Brown 1.40±0.05mV

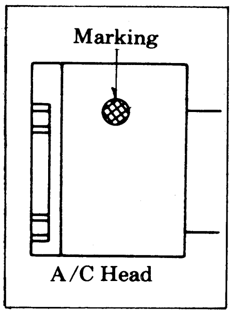


Fig. 31-a A/C Head

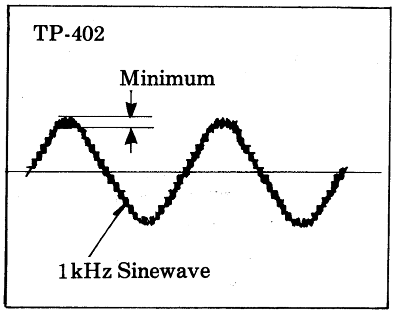


Fig. 31-b Bias Leakage

B. Dummy Coil Adjustment

1. Play back a pre-recorded tape. (Since the Audio signal recorded on the tape will be erased under the following procedure, be sure to use the tape whose audio is allowed to be erased.)
2. Under the items 1—3 condition, make an audio dubbing by pressing the Audio Dubbing button during playback.
3. Adjust the DUMMY COIL (L404) on the Audio board so the bias leakage becomes minimum as shown in Fig. E31-6.

2-3-3. Playback Gain Adjustment

Test Point: TP401
Adjustment: R404 (P.B. GAIN)
R405 (P.B. EQ)

1. Supply the sinewave signal (1kHz and 5kHz, −30dB) to the Audio Input on the rear panel.
2. Insert the cassette and make a recording 1kHz first then 5kHz signal in the SP mode, read the voltage of 1kHz.
3. Connect the VTVM to TP401 on the Audio board.
4. Play back the portion just recorded.
5. Adjust the P.B. GAIN (R404) so the voltages of 1kHz at recording and playback are equal.
6. Adjust the P.B. EQ (R405) so the 1kHz and 5kHz outputs are balanced.

2-4. VIDEO SECTION

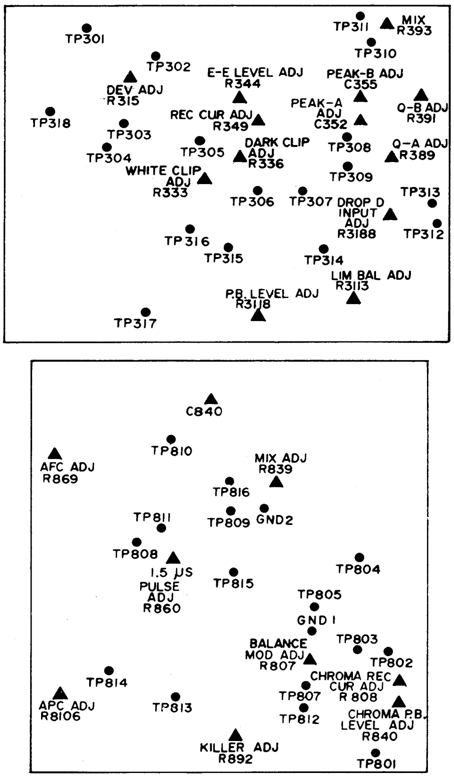

TP301
TP311
MIX
R393
TP310
TP302
E-E LEVEL ADJ
R344
PEAK-B ADJ
C355
DEV ADJ
R315
PEAK-A
ADJ
C352
Q-B ADJ
R391
TP318
REC CUR ADJ
R349
TP303
DARK CLIP
ADJ
R336
TP308
Q-A ADJ
R389
TP304
TP305
WHITE CLIP
ADJ
R333
TP309
TP306
TP307
DROP D
INPUT
ADJ
R3188
TP313
TP312
TP316
TP315
TP314
LIM BAL ADJ
R3113
P.B. LEVEL ADJ
R3118
TP317
C840
TP810
AFC ADJ
R869
MIX ADJ
R839
TP816
TP811
TP809
GND2
TP808
1.5 μS
PULSE
ADJ
R860
TP815
TP804
TP805
GND 1
BALANCE
MOD ADJ
R807
TP803
TP802
CHROMA REC
CUR ADJ
R 808
TP814
TP807
APC ADJ
R8106
TP813
TP812
CHROMA P.B.
LEVEL ADJ
R840
KILLER ADJ
R892
TP801

Fig. E32

2-4-1. Head Amp Peak Frequency Adjustment

A. Factory Adjustment

Test Point: Emitter of Q317

Adjustment: C352 (PEAK-A ADJ)
C355 (PEAK-B ADJ)

1. Do not supply any video or RF signal to the rear panel.
2. Connect the sweep generator to TP308 and TP310 on the Luminance Board through 39KΩ resistors.

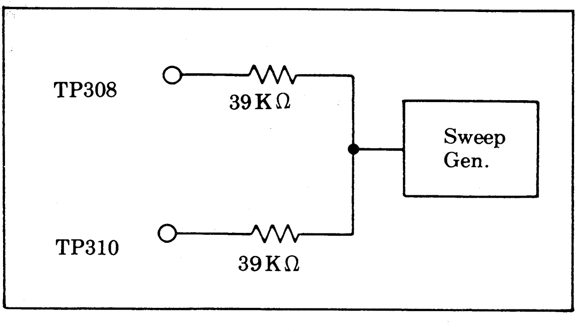

TP308
39KΩ
Sweep
Gen.
TP310
39KΩ

Fig. E33 Connection of Sweep Generator

3. Turn controls as follows (All controls are on Luminance board.)
   R389 (Q-A ADJ)......Fully Counterclockwise
   R383 (Q-B ADJ)......Fully Clockwise
   R391 (MIX)............Center
4. Connect the scope to Emitter of Q317.
5. Blind the takeup photo transistor by black tape and place the unit in the PLAY mode.
6. Adjust the level of sweep generator to 800mVp-p ±300mVp-p at Emitter of Q317.
7. Adjust the PEAK-A ADJ (C352) and PEAK-B ADJ (C355) so the peaks on the scope are 4.5MHz.

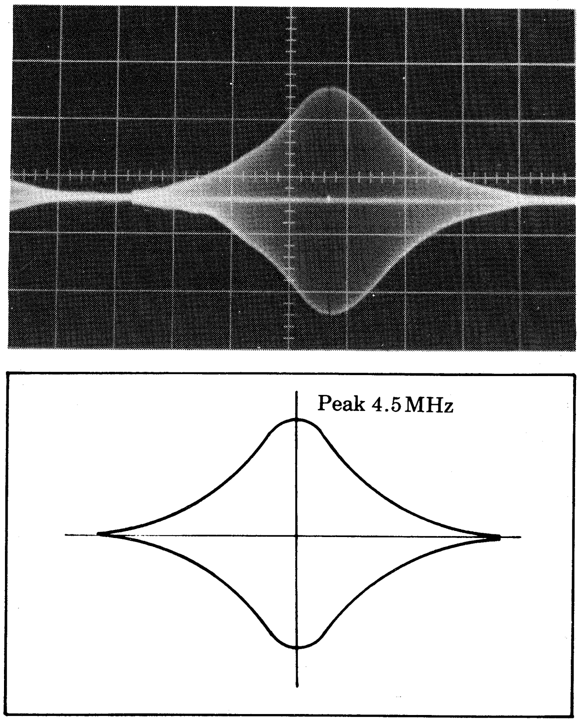


Fig. E34 Peak Frequency

8. Remove the Resistors.

B. Field Adjustment

1. Do not supply any video or RF signal to the rear panel.
2. Connect a signal generator (sinewave) to TP308 and TP310, on the Luminance board through 39K resistors.
3. Same as factory adjustment.
4. Connect the scope to emitter of Q317.
5. Blind the takeup photo transistor by black tape, and place the unit in the PLAY mode.
6. Adjust the level of sweep generator to 800mVp-p ±300mVp-p.
7. Adjust the PEAK-A ADJ (C352) and PEAK-B ADJ (C355) so the peaks on the scope are 4.5MHz.

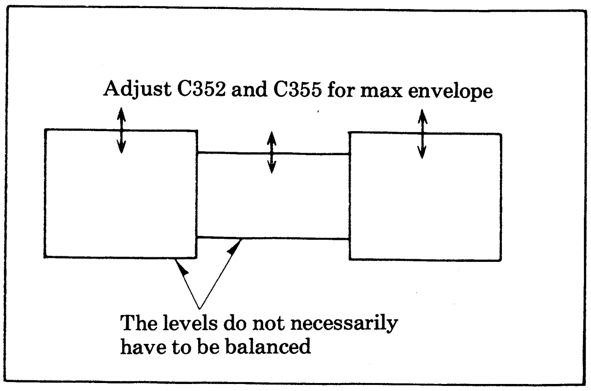

Adjust C352 and C355 for max envelope
The levels do not necessarily
have to be balanced

Fig. E35 Peak Frequency

2-4-2. Head Amp Frequency Response and Balance Adjustment

Test Point: Emitter of Q317
Adjustment: R389 (Q-A ADJ)
R393 (Q-B ADJ)
R391 (MIX)

A. Factory Adjustment

1. Supply the V sync to Video Input on the rear panel from sweep generator.
2. Connect a jumper between TP306 and GND.
3. Connect the sweep generator to TP307.
   Put the marker on 2 MHz, 3.4 MHz and 4.5 MHz.
4. Connect the jumper between TP812 and GND.
5. Connect the scope between TP310 (HOT) and TP311 (GND).
6. Insert a cassette tape and make a recording for a few minutes.
7. Adjust the level of sweep generator to 13 mAp-p (130 mVp-p) at 3.4 MHz.

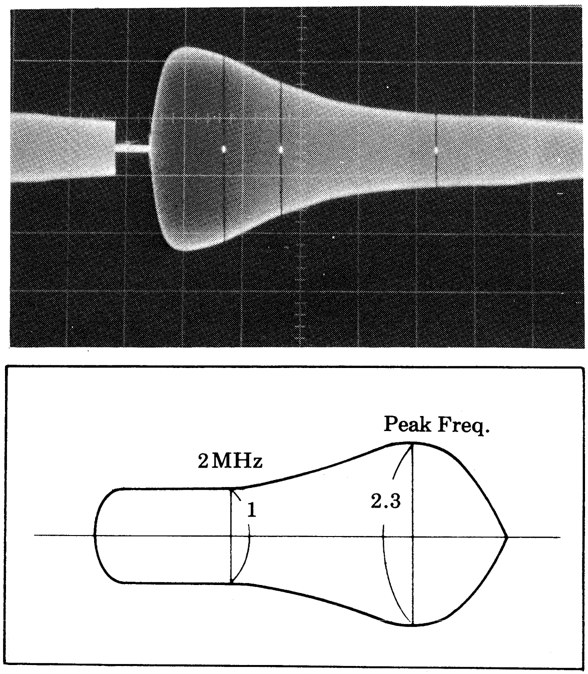


Fig. E36 Head Amp Frequency Response

8. Play back the portion just recorded.
9. Connect the scope to Emitter of Q317.
10. Connect the jumper between TP308 and GND.
11. Adjust the Q-A ADJ (R389) so the level of peak frequency is 2.3 ± 0.1 times bigger than level of 2 MHz.
12. Remove the jumper from TP308.
13. Connect the jumper between TP310 and GND.
14. Adjust the Q-B ADJ (R393) so that the level of peak frequency is 2.3 ± 0.1 times bigger than level of 2 MHz.
15. Remove the jumper from TP310.
16. Adjust the MIX (R391) so the level of peak frequency equal.

2-4-3. E-E Level Adjustment

Test Point: TP317
Adjustment: R344 (E-E LEVEL ADJ)

1. Supply a video signal to Video Input on the rear panel or tune in a local on-air TV program.
2. Connect the scope to TP317.
3. Place the unit in STOP mode.
4. Adjust the E-E LEVEL ADJ (R344) on the Luminance Board so the video level is 2.0 ± 0.05 Vp-p.

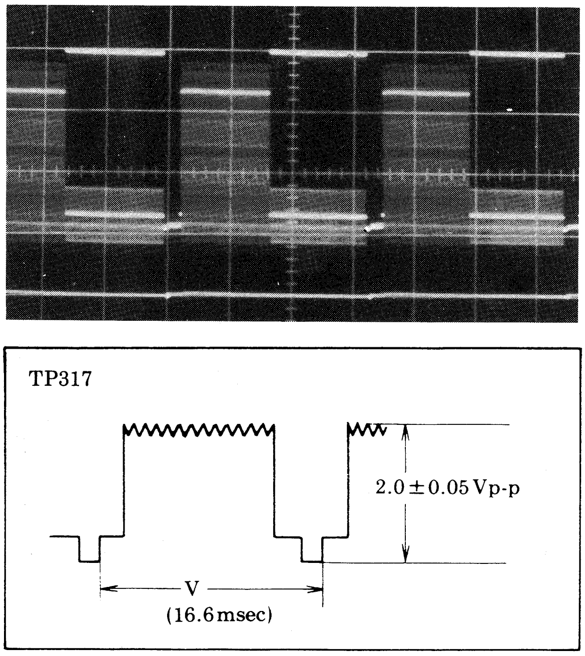


Fig. E37 E-E Video Level

2-4-4. Sync Tip Frequency and Deviation Adjustments

Test Point: TP315
Adjustment: C324 (SYNC TIP FREQ ADJ)
R315 (DEV ADJ)

Before proceduring the following adjustments, several adjustment connections are required.

a. Connect a jumper between pins 1 and 2 of connector JC on the Luminance board in order to keep the modulator and demodulator turned on at all times.
b. Connect a 1 KΩ resistor and 0.01μF (or 0.047μF) capacitor, in series between TP306 and TP314 on the Luminance board. This will feed the modulator output to the demodulator input.

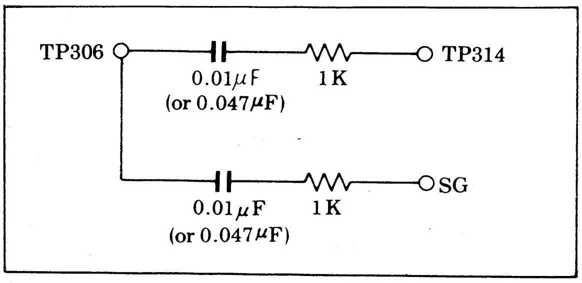


Fig. E38

c. Connect a signal generator (sinewave) to TP306 through a 1 KΩ resistor and a 0.01μF (or 0.047μF) capacitor.
   1. Prior to this adjustment, turn the WHITE CLIP ADJ (R333) fully CW and DARK CLIP ADJ (R336) fully CW.
   2. Supply a B/W stair-step signal to Video Input on the rear panel.
   3. Connect the scope to TP315 on the same board.
   4. Set the frequency of signal generator to 3.4 MHz ± 30 kHz.

5. Insert the cassette tape and place the unit in SP RECORD mode.
6. Adjust the SYNC TIP FREQ ADJ (C324) for minimum carrier at sync tips.

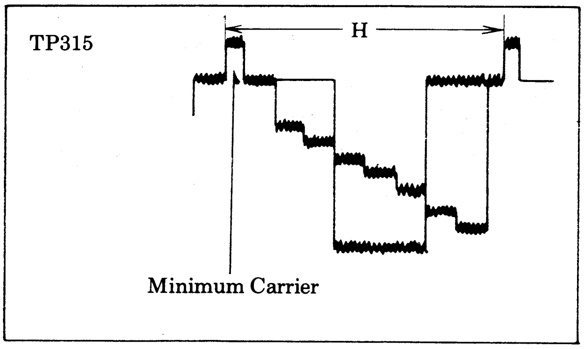


Fig. E39 Sync Tip Frequency

7. Change the frequency of the signal generator from 3.4MHz to 4.35MHz ±30kHz.
8. Adjust the DEV ADJ (R315) for minimum carrier at peak white.
9. Remove the jumpers.

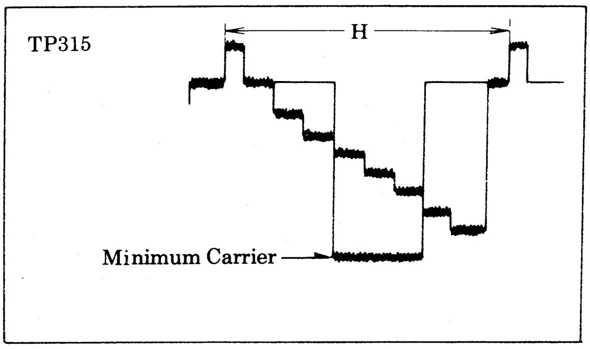


Fig. 40 White Peak Frequency

2-4-5. White and Dark Clip Adjustments

Test Point: TP305
Adjustments: DARK CLIP ADJ (R336)
WHITE CLIP ADJ (R333)

1. Supply a color bar signal to the Video Input on the rear panel.
2. Connect the scope to TP305 on the Luminance board.
3. Place the unit in the SP RECORD mode.
4. Adjust the WHITE CLIP ADJ (R333) and DARK CLIP ADJ (R336) on the same board so the overshoot and undershoot are as shown in Fig. E41.

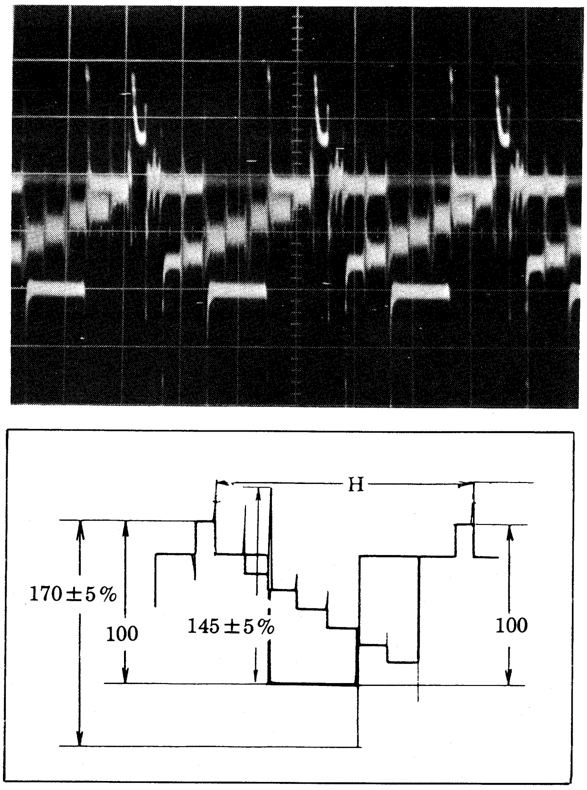


Fig. E41 White and Dark Clip

2-4-6. Recording Current Adjustment

Test Points: TP310, TP311
Adjustments: R349 (REC CUR ADJ)
R808 (CHROMA REC CUR ADJ)

1. Supply a color bar signal to Video Input on the rear panel.
2. Insert a cassette and make a recording in SP mode.
3. Connect the scope between TP310 (Hot) and TP311 (Ground) on the Luminance board.
4. Turn the REC CUR ADJ (R349) to fully clockwise.
5. Adjust the CHROMA REC CUR ADJ (R808) on the Chrominance board so the level of cyan portion is 32 ± 1mVp-p.

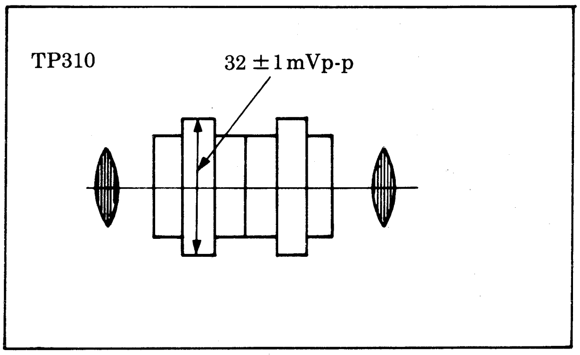


Fig. E42 Chroma Record Current

6. Then slowly turn the REC CUR ADJ (R349) on the Luminance board so that the V sync portion on the envelope at TP310 is 130 ±5mVp-p.

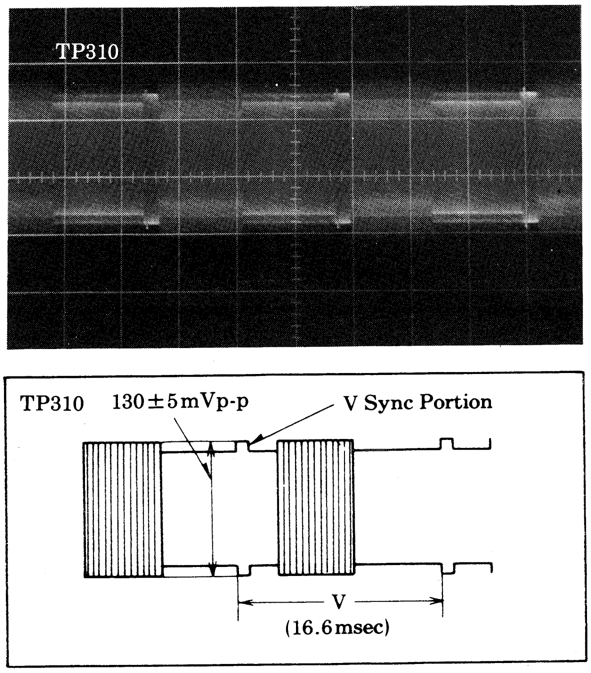


Fig. E43 Luminance Record Current

2-4-7. Dropout Detector Input Level Adjustment

Test Point: TP314

Adjustment: R3188 (DROP D INPUT ADJ)

1. Supply a video signal to Video Input on the rear panel or tune in local on-air TV program.
2. Insert a cassette and make a recording for a few minutes.
3. Play back the portion just recorded.
4. Connect the scope to TP314 on the Luminance board.
5. Adjust the DROP D INPUT ADJ (R3188) so the level is 800mVp-p.

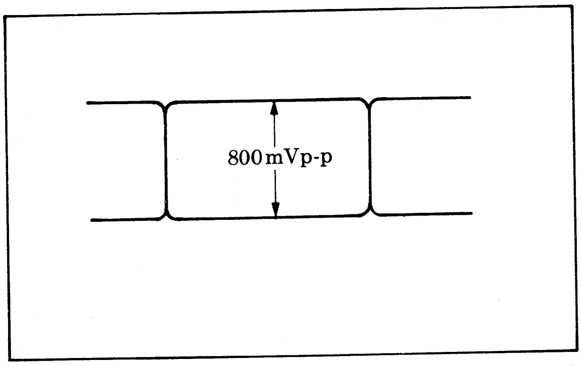


Fig. E44 R.F Signal

2-4-8. Limiter Balance Adjustment

Test Point: TP315

Adjustment: R3113 (LIM BAL ADJ)

1. Supply a stairstep signal to the Video Input on the rear panel or tune in a local on-air B/W TV program.
2. Place the unit in the SP mode and make a recording for a few minutes.
3. Play back the portion just recorded.
4. Connect the scope to TP315 on the Luminance board.
5. During playback, adjust the LIM BAL ADJ (R3113) on the same board so the carrier at sync tips is minimum at TP315.

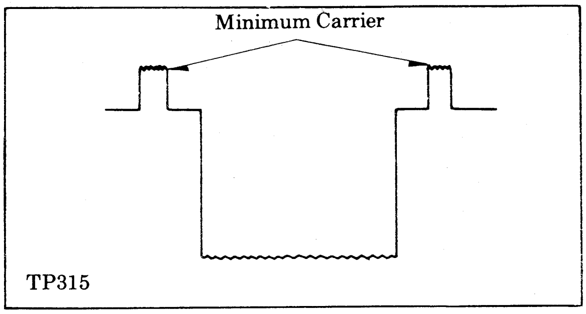


Fig. E45 Limiter Balance

2-4-9. 3.58MHz Crystal Oscillator Adjustment

Test Point: TP809

Adjustment: C840

1. No need to supply any video signal to the rear panel.
2. Place the unit in STOP mode.
3. Connect the frequency counter to TP809 on the Chrominance board.
4. Adjust the capacitor C840 so the frequency at TP809 is 3.579545MHz ± 10Hz.

2-4-10. LP/SP Burst Level Confirmation

Test Point: TP802

1. Supply a color bar signal to Video Input on the rear panel or tune in a local on-air color TV program.
2. Place the unit in the RECORD mode.
3. Set the LP/SP selector on the top panel to the SP mode.
4. Connect the scope to TP802 on the Chrominance board and read the burst level.
5. Change the selector from SP to LP and read the burst level.
6. Make sure that the burst level of SP is 1.6±0.3 times bigger than burst level of LP.

2-4-11. 1.5μs Pulse Adjustment

Test Point: TP811

Adjustment: R860 (1.5μs PULSE ADJ)

1. Supply a color bar signal to Video Input on the rear panel or tune in a local on-air TV program.
2. Insert a cassette and make a recording in SP mode.
3. Connect the scope to TP811 on the Chrominance board.
4. Adjust the 1.5μs PULSE ADJ (R860) on the same board so the T portion of waveform at TP811 is 1.5±0.1μsec.

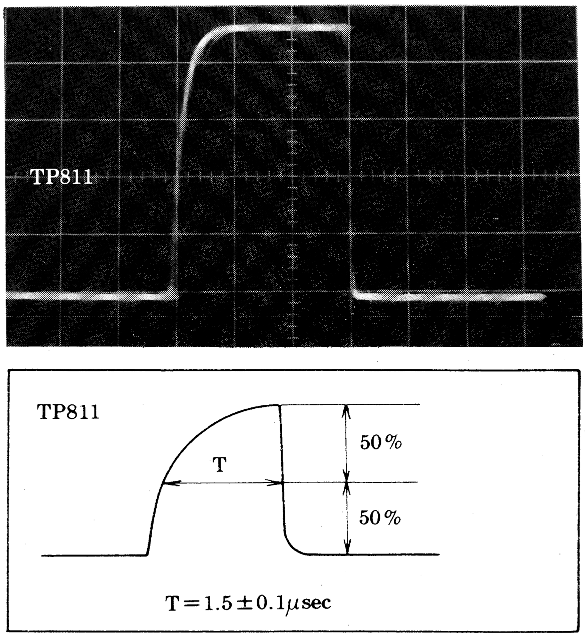


Fig. E46 1.5μsec Pulse

2-4-12. AFC Adjustment

Test Points: TP810, TP811
Adjustment: R869 (AFC ADJ)

1. Supply a color bar signal to Video Input on the rear panel or tune in a local on-air TV program.

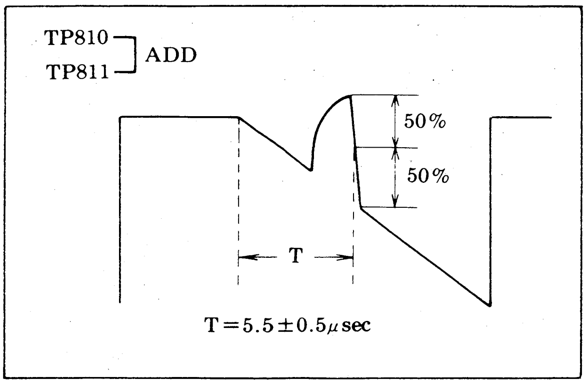

TP810
TP811
ADD
50%
50%
T
T=5.5±0.5μsec

Fig. E47 AFC

2. Insert a cassette and make a recording in SP mode.
3. Connect the scope CH1 to TP810 and CH2 to TP811 on the Chrominance board.
   Set the scope to ADD mode.
4. Adjust the AFC ADJ (R869) on the same board so the phase relationship between TP810 and TP811 are as shown in Fig. E47.

2-4-13. APC 3.58 MHz VXO Adjustment

Test Point: TP814
Adjustment: R8106 (APC ADJ)

1. Supply a B/W video signal to Video Input on the rear panel or tune in a local on-air B/W TV program.
2. Connect the jumper between TP813 and ground through a capacitor 16V 47μF.
3. Insert a cassette and make a recording.
4. Connect the frequency counter to TP814.
5. Adjust the APC ADJ (R8106) so the frequency at TP814 3.579545 MHz ± 10 Hz.

2-4-14. Comb Filter Adjustment

A. Factory Adjustment
   Test Point: TP8Q4
   Adjustment: R839 (MIX ADJ)
   1. Connect a color bar signal to Video Input on the rear panel.
   2. Connect a capacitor (0.047μF or more) between TP805 and ground.
   3. Connect a capacitor 0.01μF between TP301 on the Luminance board and TP815 on the Chrominance board.
   4. Connect a jumper between base of Q818 and ground.
   5. Place the unit in STOP mode.
   6. Connect a vector scope to TP804.
   7. External trigger a vector scope by TP818.
   8. Adjust the MIX ADJ (R839) so that the level of $\overrightarrow{Ra}$ and $\overrightarrow{Rb}$ are balanced. ($|\overrightarrow{Ra}| = |\overrightarrow{Rb}|$).
   9. Alternately turn transformers T801 so $\overrightarrow{Ra}$ and $\overrightarrow{Rb}$ are just on $\overrightarrow{R}$.

B. Field Adjustment
   1. Supply a color bar signal to the Video Input on the rear panel.
   2. Place the unit in the RECORD mode and make a recording in the LP mode.
   3. Connect the scope to TP317 on the Luminance board.
   4. Play back the portion just recorded.
   5. Turn the Tracking Control on the top panel for the poorest tracking. (Worst playback image).
   6. During playing back, adjust the MIX ADJ (R839) on the Chrominance board for the minimum beat on the Chrominance portion as shown in Fig. E48.

Note: In this field adjustment procedure, the phase adjustment can not be performed, therefore, do not turn transformer T801.

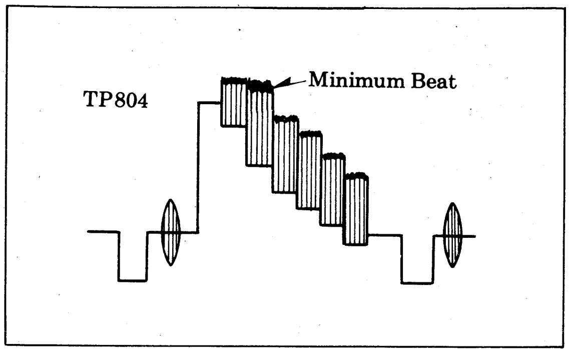

TP804
Minimum Beat

Fig. E48

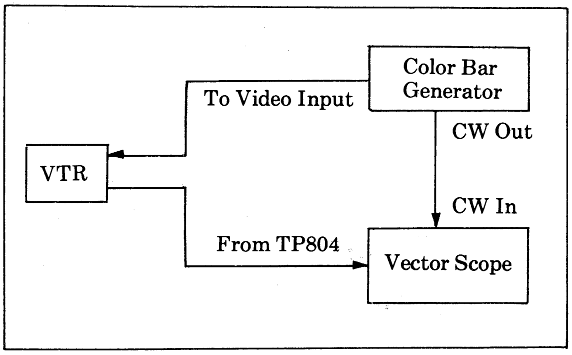
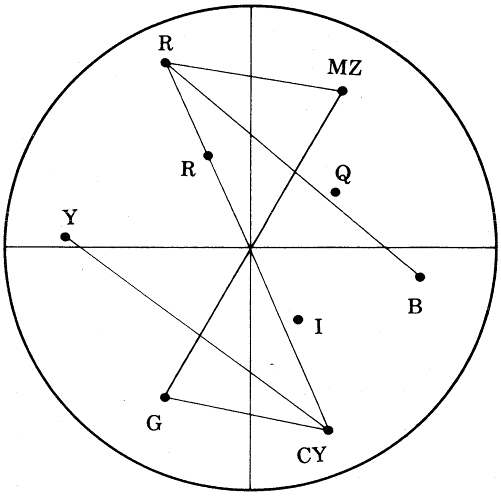

Color Bar Generator
To Video Input
CW Out
VTR
CW In
From TP804
Vector Scope

Fig. E49


R
MZ
R
Q
Y
B
I
G
CY

Vector Display of Color Bars

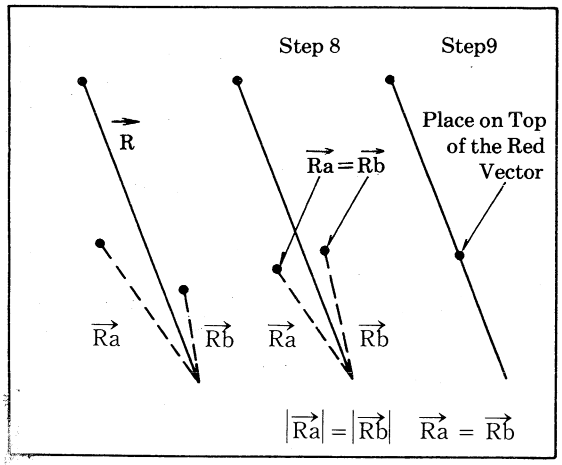

Step 8
Step9
$\overrightarrow{R}$
$\overrightarrow{Ra}=\overrightarrow{Rb}$
Place on Top of the Red Vector
$\overrightarrow{Ra}$
$\overrightarrow{Rb}$
$\overrightarrow{Ra}$
$\overrightarrow{Rb}$
$|\overrightarrow{Ra}| = |\overrightarrow{Rb}|$
$\overrightarrow{Ra} = \overrightarrow{Rb}$

Fig. E50 Comb Filter

2-4-15. BALANCE Modulator Adjustment

Test Point: TP805

Adjustment: R807 (BALANCE MOD ADJ)

1. Supply a color bar signal to Video Input on the rear panel or tune in a local on-air color TV program.
2. Place the unit in the RECORD mode.
3. Connect the scope to TP805 on the Chrominance board.
4. Adjust the BALANCE MOD ADJ (R807) for minimum carrier.

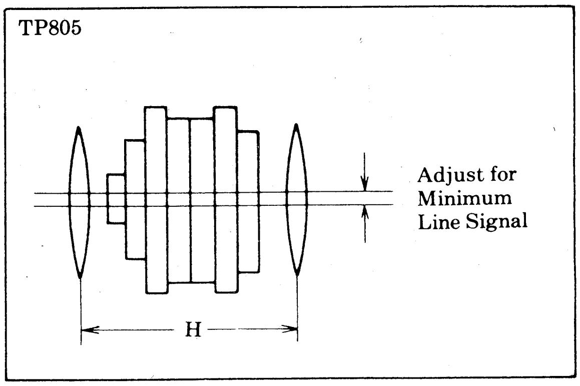


Fig. E51 Modulation Balance

2-4-16. Color Killer Adjustment

Test Point: TP812

Adjustment: R892 (KILLER ADJ)

1. Supply a color bar signal to the Video Input on the rear panel or tune in a local on-air color TV program.
2. Connect a 22 resistor in parallel with R3162 on the Luminance board to reduce the chroma input by about 26dB (1.5mVp-p).
3. Connect the scope to TP812 on the Chrominance board and monitor with the scope in the DC couple mode.
4. Place the unit in the RECORD mode.
5. Turn the KILLER ADJ (R892) CCW, and adjust F.C. just to the point that the DC voltage is changed Low to High (More than 10V DC) on the scope.
6. Supply a B/W signal to Video Input on the rear panel or tune in a local on-air B/W TV program.
7. Make sure that the voltage at TP812 is low.

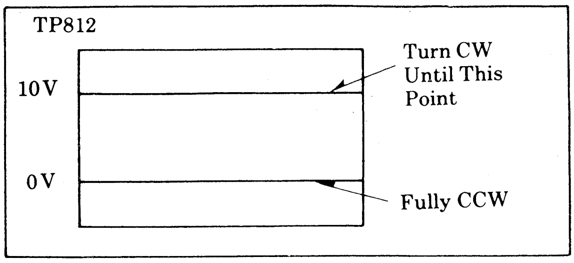


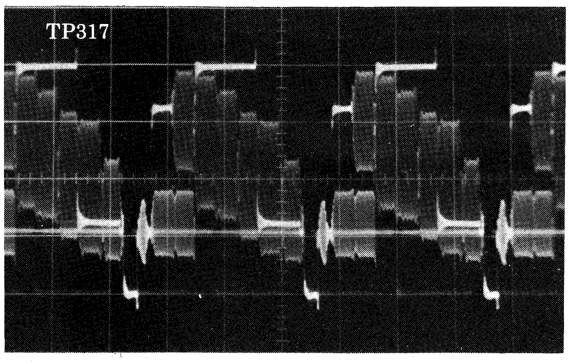
Fig. E52 Scope Display at TP812

2-4-17. Video/Chroma Level Adjustment

Test Point: TP317

Adjustment: R3118 (P.B. LEVEL ADJ)
R840 (CHROMA P.B. LEVEL ADJ)

1. Supply a video signal to Video Input on the rear panel or tune in a local on-air TV program.
2. Insert a cassette and make a recording for a few minutes.
3. Connect the scope to TP317 on the Luminance Board.
4. Play back the portion just recorded.
5. During playing back, adjust the P.B. LEVEL ADJ (R3118) so the video level is 2.0±0.1Vp-p.
6. Then adjust the CHROMA P.B. LEVEL ADJ (R840) on the Chrominance board so the level of cyan portion is 1.2±0.05Vp-p.



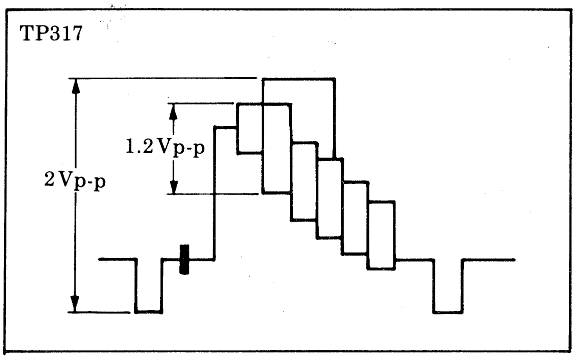


Fig. E53 Video/Chroma Level

2-4-18. Audio Bias Trap Adjustment

Test Point: TP318

Adjustment: L309

1. Cover the photo transistor with a piece of black tape.
2. Place the unit in the PLAY mode with no tape in the unit.
3. Connect the scope to TP318 on the Luminance board.
4. Slide the Rec-Play Switch (S401) on the Audio board to Rec position and hold it there.
5. Adjust L309 on the Luminance board so the audio bias leak is minimum as shown in Fig. E54.

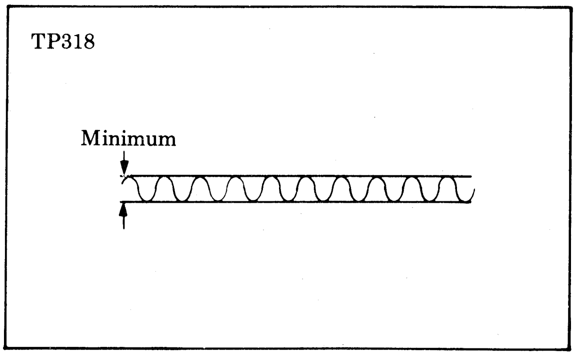
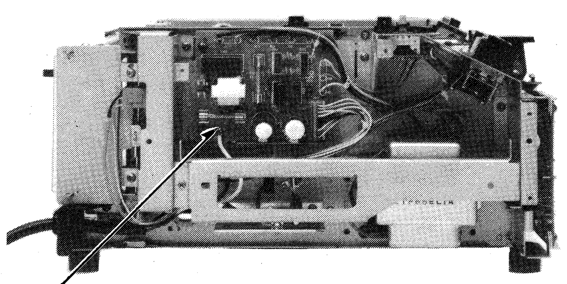


Fig. E54 Audio Bias

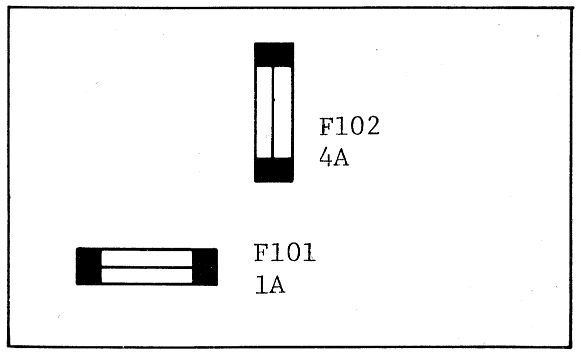
Location of Test Points and Controls

Power Supply C.B.A.

VEP0156A

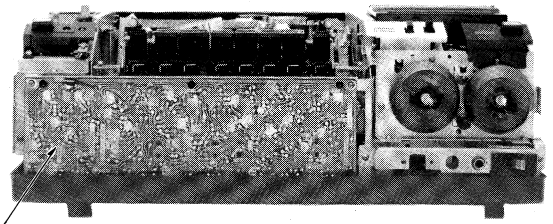


Power Supply C.B.A. (VEP0156A)

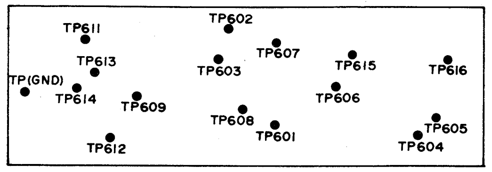

F102
4A
F101
1A

Regulator & Transport C.B.A.

VEP0665A1

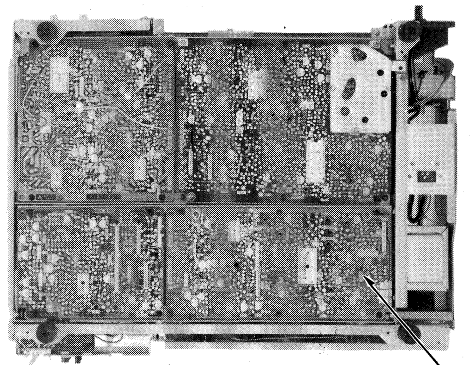


Regulator & Transport C.B.A. (VEP0665A1)

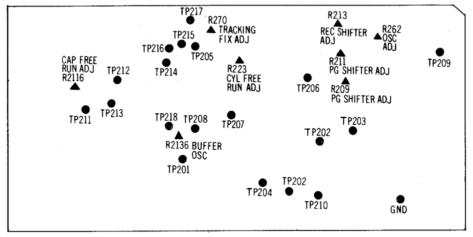

TP611
TP602
TP607
TP613
TP603
TP615
TP616
TP(GND)
TP614
TP609
TP606
TP608
TP601
TP605
TP612
TP604

Servo C.B.A.

VEP0283B

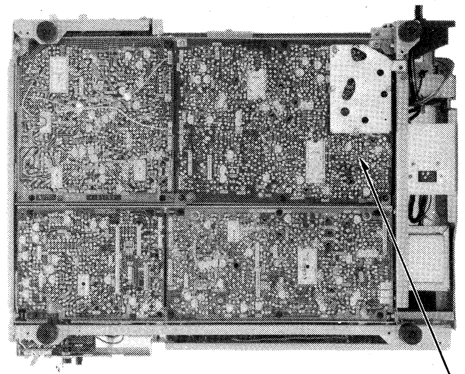


Servo C.B.A. (VEP0283B)

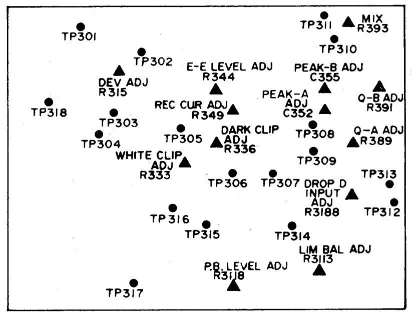

TP217
R270 TRACKING FIX ADJ
TP215
TP216
TP205
R213 REC SHIFTER ADJ
R262 OSC ADJ
CAP FREE RUN ADJ R2116
TP212
TP214
R223 CYL FREE RUN ADJ
R211 PG SHIFTER ADJ
TP206
R209 PG SHIFTER ADJ
TP209
TP211
TP213
TP218
TP208
TP207
R2136 BUFFER OSC
TP201
TP202
TP203
TP204
TP202
TP210
GND

Luminance Process C.B.A.

VEP0370A

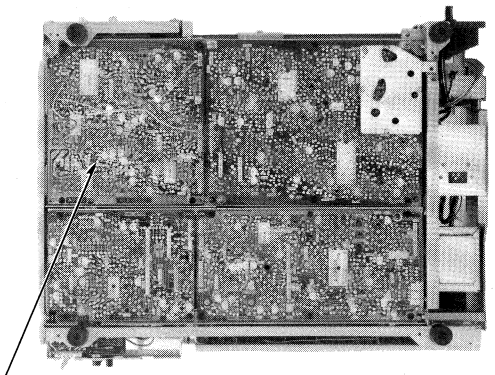


Luminance Process C.B.A. (VEP0370A)

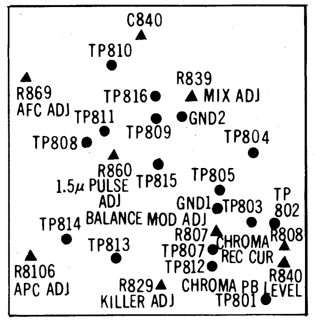

TP301
TP311
MIX R393
TP310
TP302
E-E LEVEL ADJ R344
PEAK-B ADJ C355
DEV ADJ R315
PEAK-A ADJ C352
Q-B ADJ R391
TP318
REC CUR ADJ R349
TP303
TP305
DARK CLIP ADJ R336
TP308
Q-A ADJ R389
TP304
WHITE CLIP ADJ R333
TP309
TP306
TP307
DROP D INPUT ADJ R3188
TP313
TP312
TP316
TP315
TP314
LIM BAL ADJ R3113
P.B. LEVEL ADJ R3118
TP317

Chrominance Process C.B.A.

VEP0843A

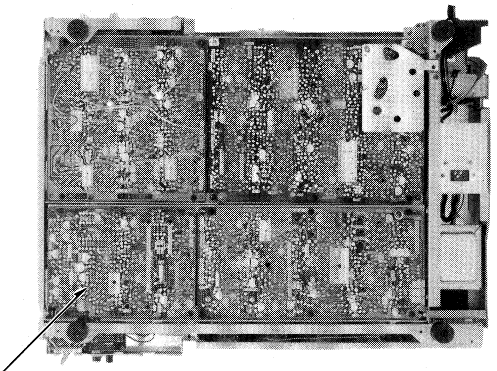


Chrominance Process C.B.A. (VEP0843A)

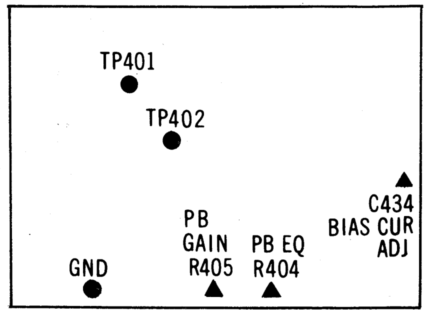

C840
TP810
R869 AFC ADJ
R839 MIX ADJ
TP816
TP811
GND2
TP809
TP808
TP804
R860 1.5μ PULSE ADJ
TP815
TP805
GND1
TP803
TP 802
BALANCE MOD ADJ
TP814
R807 CHROMA REC CUR
R808
TP813
TP807
TP812
R8106 APC ADJ
R829 KILLER ADJ
CHROMA PB LEVEL
R840
TP801

Audio C.B.A.

VEP0441A

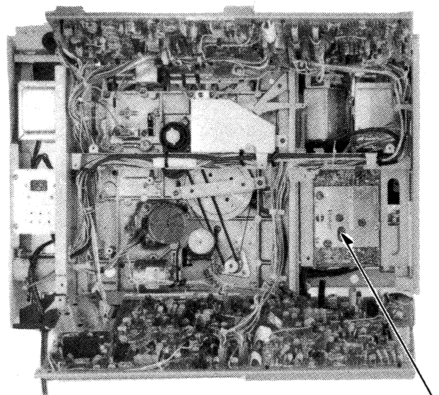


Audio C.B.A. (VEP0441A)

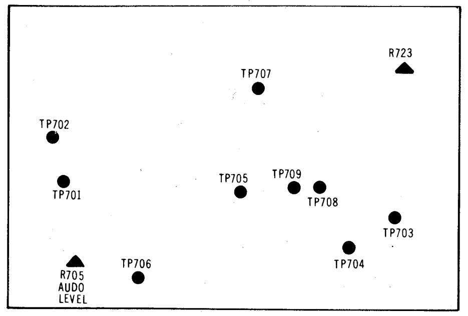

TP401
TP402
C434 BIAS CUR ADJ
GND
PB GAIN R405
PB EQ R404

TV Demodulator C.B.A.

VEP0708A

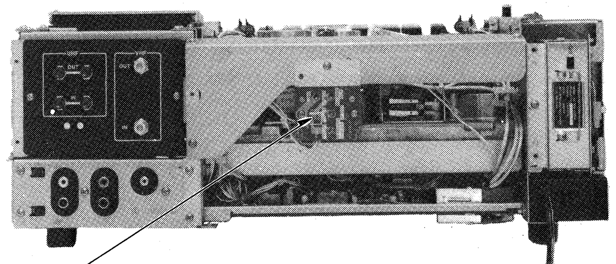


TV Demodulator C.B.A. VEP0708A

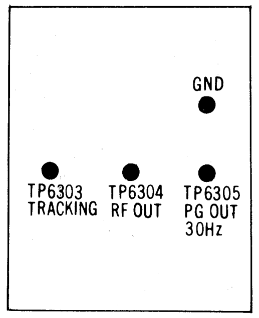

R723
TP707
TP702
TP701
TP705
TP709
TP708
TP703
TP704
R705 AUDO LEVEL
TP706

RF Envelope TP's C.B.A.

VEK0513/VJB00296



RF Envelope TP's C.B.A. (VEK0513/VJB00296)


GND
TP6303 TRACKING
TP6304 RF OUT
TP6305 PG OUT 30Hz

MECHANICAL ADJUSTMENT PROCEDURES

Disassembly Method

1. DISASSEMBLY FLOW CHART

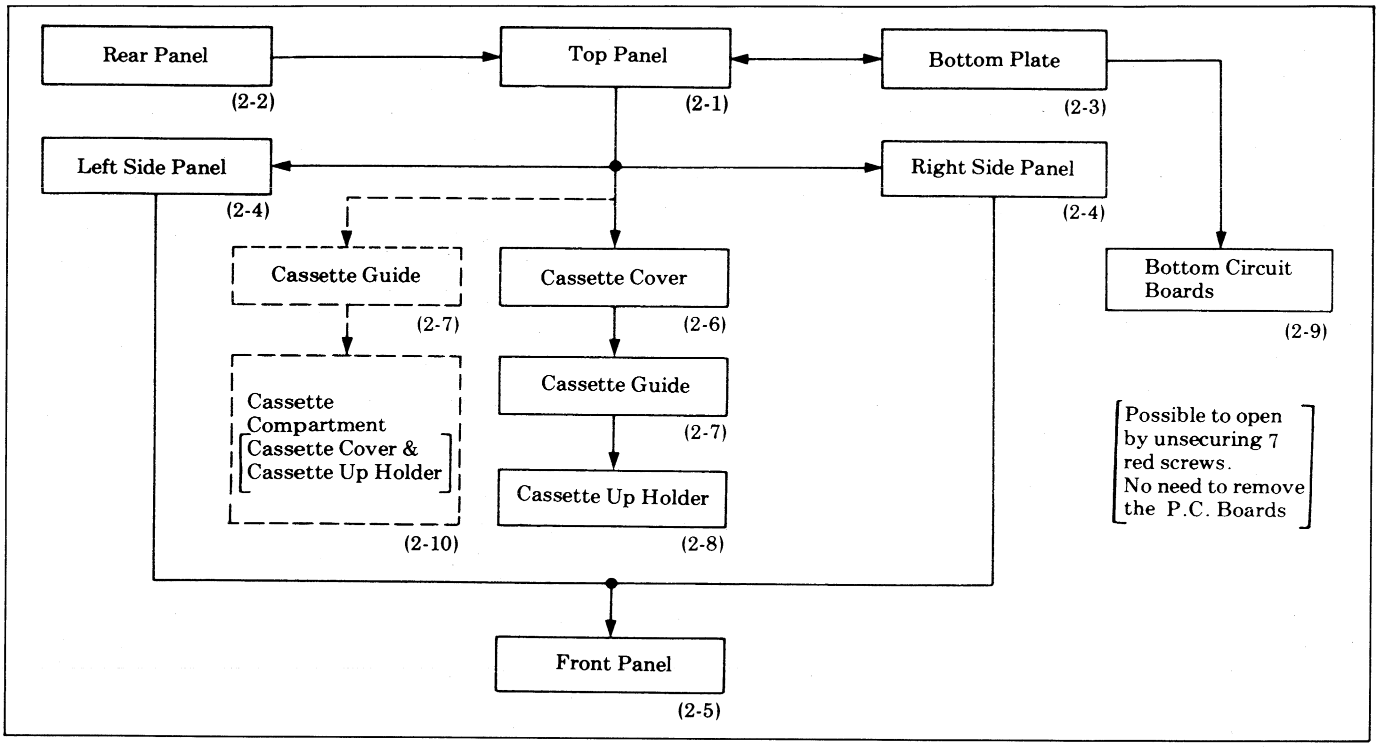

Rear Panel
(2-2)
Top Panel
(2-1)
Bottom Plate
(2-3)
Left Side Panel
(2-4)
Right Side Panel
(2-4)
Cassette Guide
(2-7)
Cassette Cover
(2-6)
Bottom Circuit Boards
(2-9)
Cassette Compartment
Cassette Cover & Cassette Up Holder
(2-10)
Cassette Guide
(2-7)
Cassette Up Holder
(2-8)
Possible to open by unsecuring 7 red screws.
No need to remove the P.C. Boards
Front Panel
(2-5)

Fig. M1 Disassembly Flowchart

2. DETAILED DISASSEMBLY METHOD

2-1. Removal of the Top Panel

1. Pull off the Tracking Control Knob.
2. Unscrew the 6 screws (A) and remove the Top Panel.

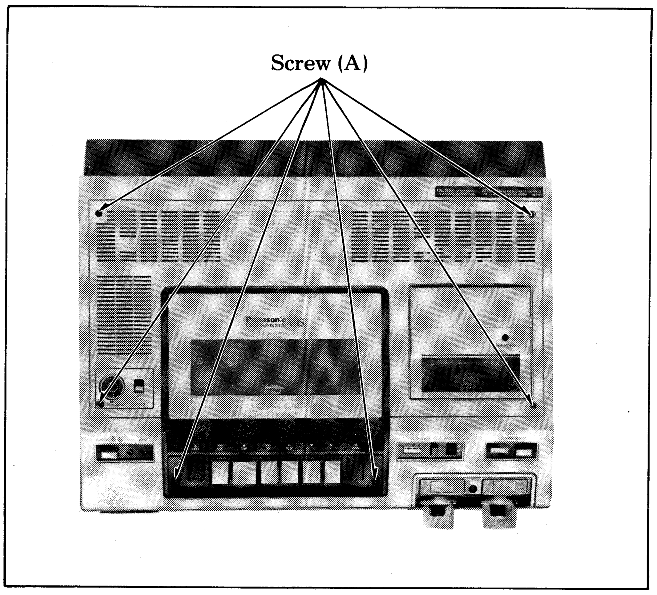

Screw (A)
Panasonic VHS

Fig. M2 Removal of the Top Panel

2-2. Removal of the Rear Panel

Unscrew 5 screws (B) and remove the Rear Panel.

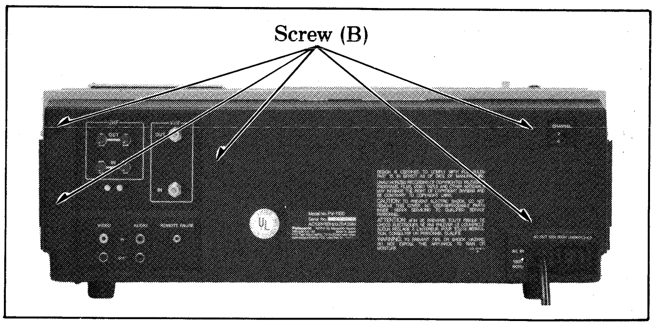


Fig. M3 Removal of the Rear Panel

2-3. Removal of the Bottom Plate

Unscrew the 6 screws (C) and remove the Bottom Plate.

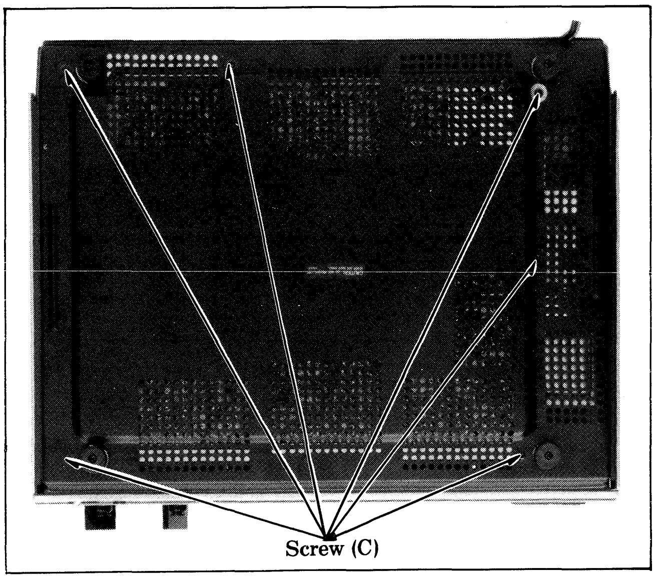


Fig. M4 Removal of the Bottom Plate

2-4. Removal of the Side Panels

Unscrew the 4 screws (D) on both sides and remove the Side Panels.

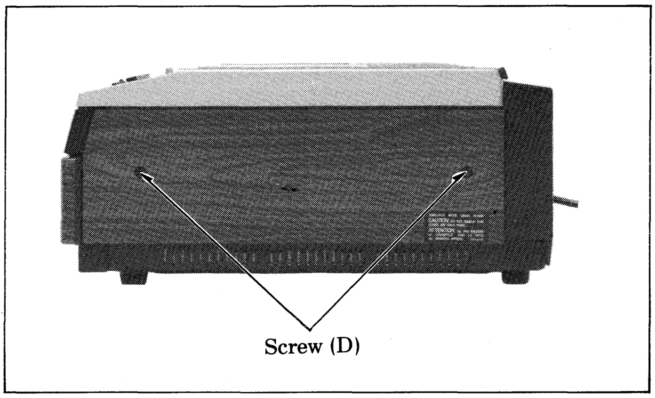


Fig. M5 Removal of the Side Panels

2-5. Removal of the Front Panel

1. Pull off the UHF and VHF knobs.
2. Unscrew the 4 red screws (E), loosen the 2 red screws (F) and remove the Front Panel.

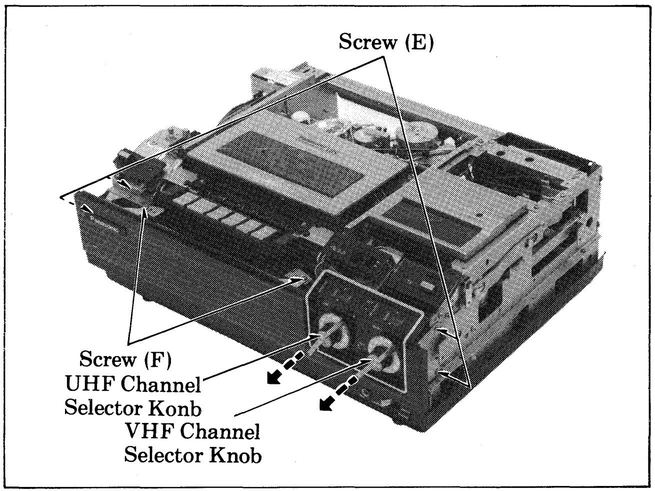

Screw (E)
Screw (F)
UHF Channel Selector Konb
VHF Channel Selector Knob

Fig. M6 Removal of the Front Panel

2-6. Removal of the Cassette Cover

1. Press the Eject Button to raise the Cassette Compartment.
2. Unscrew the 4 screws (G) and remove the Cassette Cover.

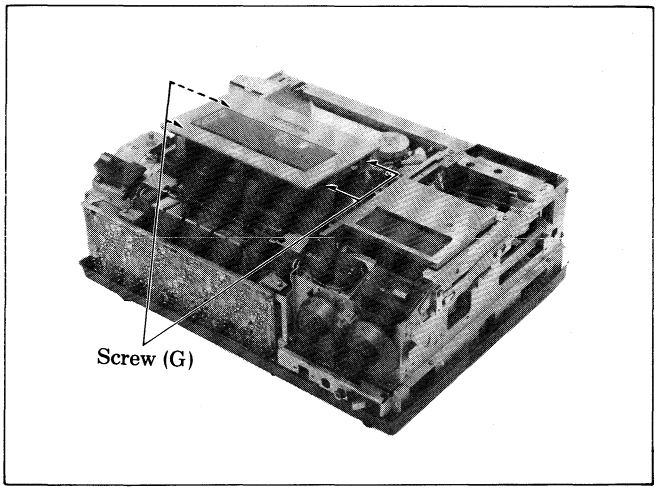


Fig. M7 Removal of the Cassette Cover

2-7. Removal of the Cassette Guide

Unscrew the 2 screws (H) and remove the Cassette Guide.

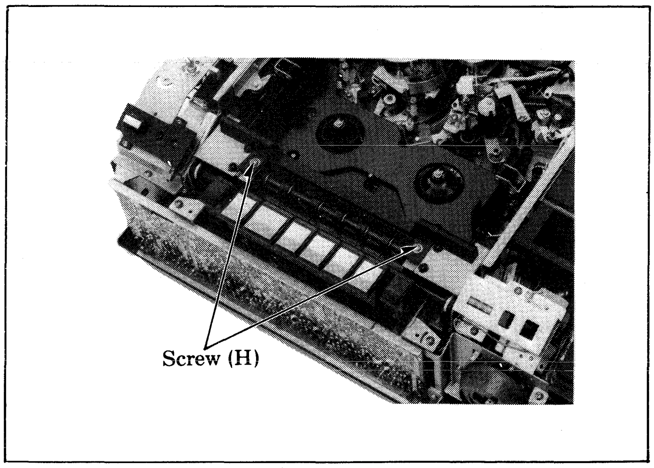


Fig. M8 Removal of the Cassette Guide

2-8. Removal of the Cassette Up Holder

Unscrew the 4 screws (I) and remove the Cassette Up Holder.

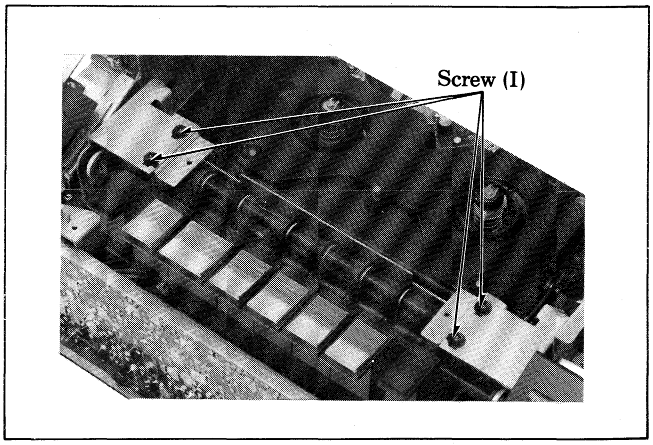


Fig. M9 Removal of the Cassette Up Holder

2-9. Opening of the Bottom Circuit Boards

Unscrew the 7 red screws (J) securing the circuit boards to the frames for replacements and adjustments of the parts which are located under the chassis.

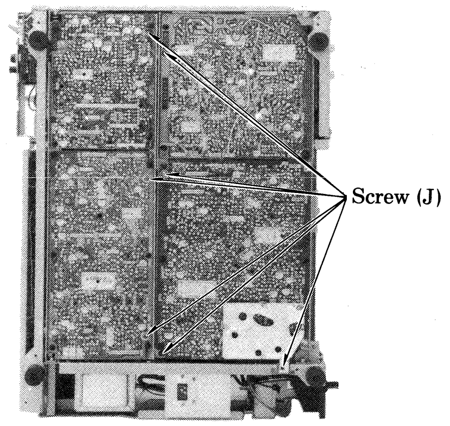


Fig. M10 Bottom Circuit Boards

2-10. Removal of the Cassette Compartment

1. Press the Eject Button to raise the Cassette Compartment.
2. Remove the Cassette guide. (Refer to section "DISASSEMBLY METHOD" Item 2-7).
3. Unscrew the 4 screws (K) and remove the Cassette Compartment.

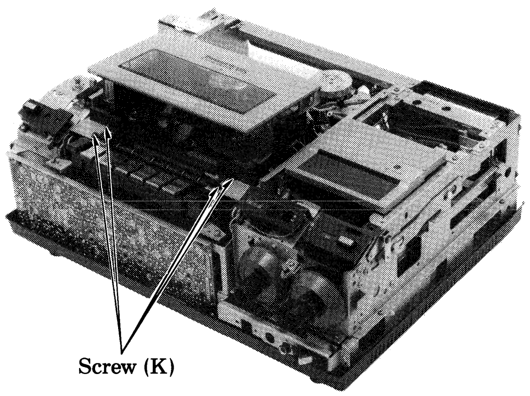


Fig. M11 Removal of the Cassette Compartment

Mechanical Maintenance Procedures

1. REPLACEMENT OF UPPER CYLINCER UNIT

1. Remove the Top Panel and the Rear Panel. (Refer to section "DISASSEMBLY METHOD", Items 2-1 and 2-2).
2. Press the Eject Button to raise the Cassette Compartment, preventing the video heads from being damaged by it.
3. Unsolder the 4 lead wires of the video heads from the head relay board.
4. Unscrew the 2 screws (A) and remove the Upper Cylinder Unit.
5. Clean the fringe, bottom and rotative surface of the new Upper Cylinder Unit with a soft cloth moistened with alcohol or freon liquid.
6. Place the new Upper Cylinder Unit on the head disc base so that the screw holes match. Tighten the 2 screws (A).
7. Solder the 4 lead wires to the head relay board.
8. Reverse the above steps to complete the installation.

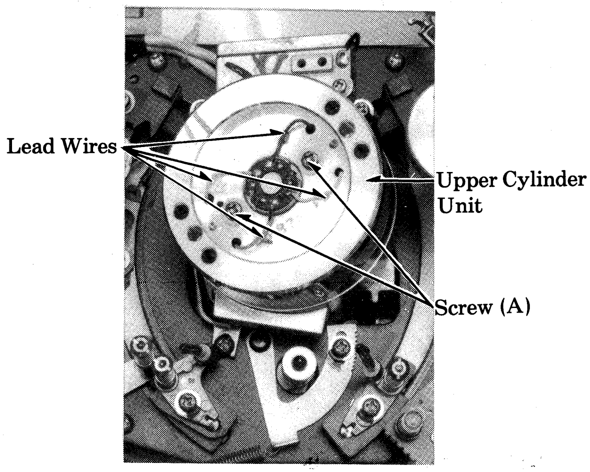


Fig. M12 Upper Cylinder Unit

2. REPLACEMENT AND ADJUSTMENT OF DD CYLINDER UNIT

A. Replacement Procedure

1. Remove the Top Panel, the Rear Panel, the Bottom plate and the Cassette Cover. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-3 and 2-6).

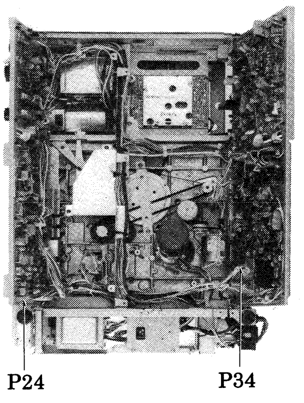


Fig. M13 Location of Connectors

2. Place the unit vertically so that the left side panel is facing down.
3. Unscrew the 7 red screws and open the Bottom P.C. Boards. (Refer to section "DISASSEMBLY METHOD", item 2-9).
4. Disconnect the connectors of P34 and P24 on the Luminance Process Board and Servo Board. Remove the lead wires from the lead clampers.
5. Unscrew 3 screws (A) securing the DD Cylinder Unit and remove it from the chassis.

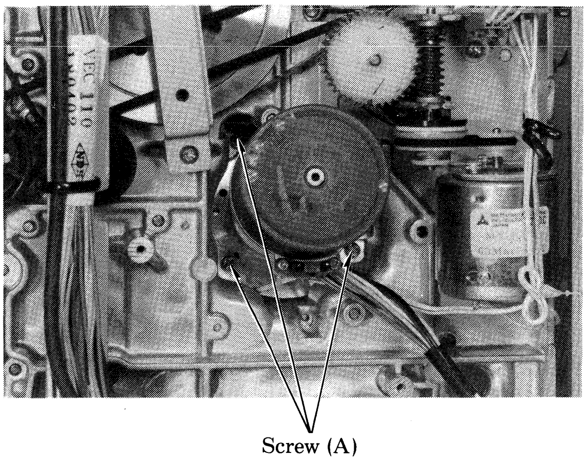


Fig. M14 Mounting Screw

6. Remove the Upper Cylinder Unit from the DD Cylinder Unit which you have just removed from the chassis. (Refer to section "REPLACEMENT OF UPPER CYLINDER UNIT").
7. Clean the fringe, bottom and rotative surface of the Upper Cylinder Unit and the new DD Cylinder Unit with a soft cloth moistened with alcohol or freon liquid.
8. Place the Upper Cylinder Unit to the new DD Cylinder Unit.
9. Mount the new DD Cylinder Unit and reverse the above steps to complete the installation.

B. **Adjustment Procedures**

When the DD Cylinder Unit is replaced, the tape interchangeability should be checked. (Refer to section "TAPE INTERCHANGEABILITY ADJUSTMENT", Item 30).

3. REPLACEMENT AND ADJUSTMENT OF ERASE HEAD

A. Replacement Procedure

1. Remove the Top Panel and the Rear Panel. (Refer to section "DISSEMBLY METHOD", Items 2-1 and 2-2).
2. Unsolder the lead wires (white and red) from the top of the Erase Head.
3. Unscrew the 2 screws (A) and remove the Erase Head Base, then unscrew the 2 screws (B) and remove the Erase Head.
4. Install a new Erase Head and reverse the above steps to complete the installation.

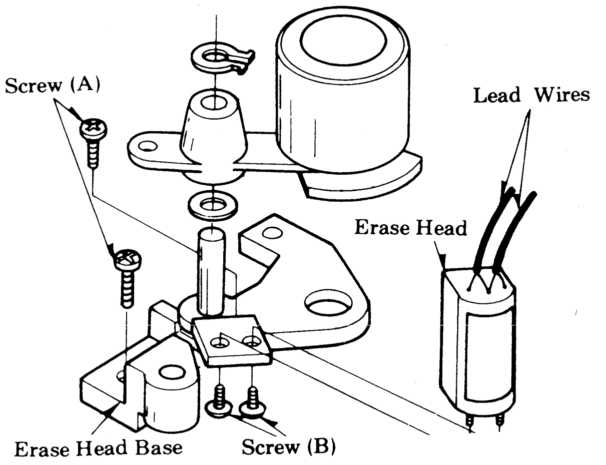


Fig. M15 Replacement of Erase Head

B. Adjustment Procedure

* *Equipment Required*
Retaining Ring Remover—4mm (VFK0145)
Check to see that the tape runs correctly past the Erase Head. If not, re-adjust the height of the posts. (Refer to section "TAPE INTERCHANGEABILITY ADJUSTMENT", Item 30.)

4. REPLACEMENT AND ADJUSTMENT OF AUDIO/CONTROL HEAD BASE UNIT

A. Replacement Procedure

* *Equipment Required:*
Retaining Ring Remover—4mm (VFK0145)
Box Driver

1. Remove the Top Panel and the Rear Panel. (Refer to section "DISASSEMBLY METHOD", Items 2-1 and 2-2).
2. Remove the Takeup Inertia Roller Unit. (Refer to section "REPLACEMENT OF TAKEUP INERTIA ROLLER UNIT" for details.)
3. Unsolder the 6 lead wires, unscrew the 2 nuts, remove the post sleeve and then remove the Head Base Unit.
4. Install a new A/C Head Base Unit and reverse the above steps to complete the installation.

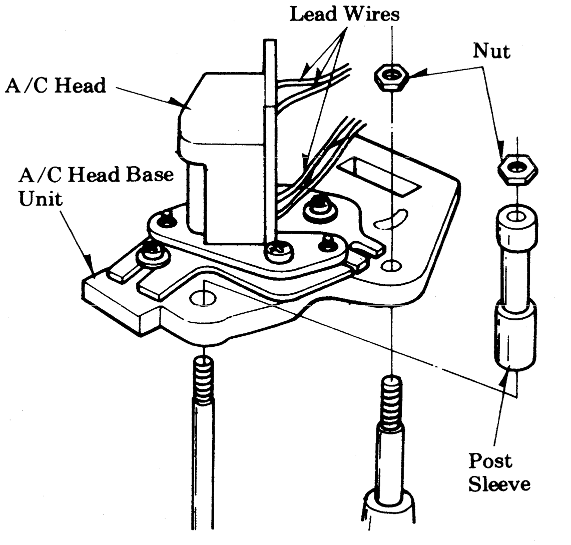


Fig. M16 Replacement of A/C Head Base Unit

B. Adjustment Procedure

* *Equipment Required:*

Retaining Ring Remover—4mm (VFK0145)

Box driver

The height and tilt adjustment procedures of the A/C Head are described in "TAPE INTERCHANGEABILITY ADJUSTMENT" Item 30.

5. REPLACEMENT OF CAPSTAN MOTOR

A. Replacement Procedures

1. Remove the Top Panel, the Rear Panel, the Bottom plate and open the Bottom P.C. Boards. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-3 and 2-9).
2. Remove the Capstan Belt and Reel Belt A from the Capstan Motor Pulley.

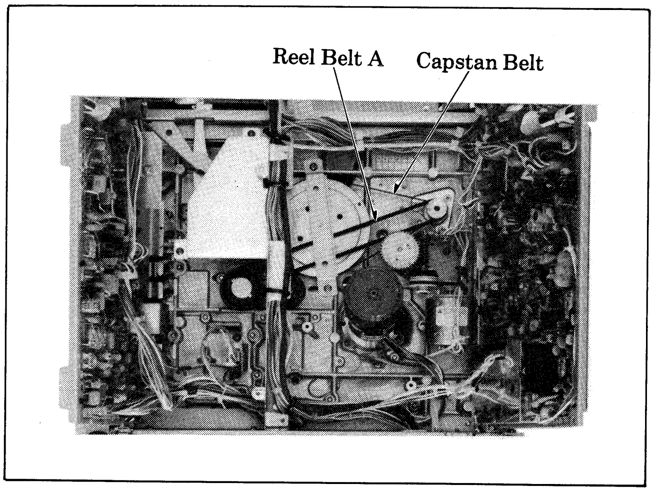


Fig. M17 Bottom View

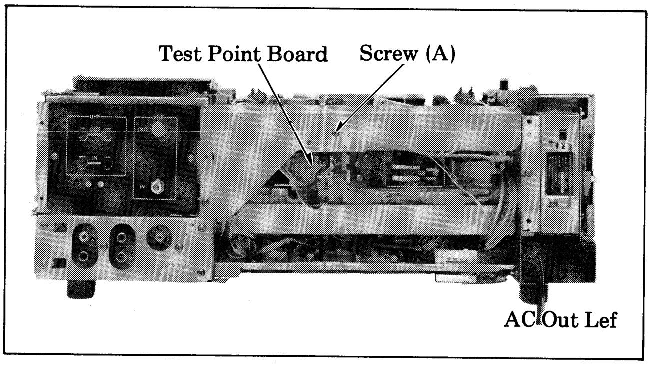


Fig. M18 Removal of Test Point Board

3. Unscrew a screw (A) and remove the Test Point Board.
4. Remove the Inertia Roller Spring from the motor bracket and disconnect the connector P605.
5. Unscrew the 3 screws (B) and remove the Capstan Motor Unit from the chassis.

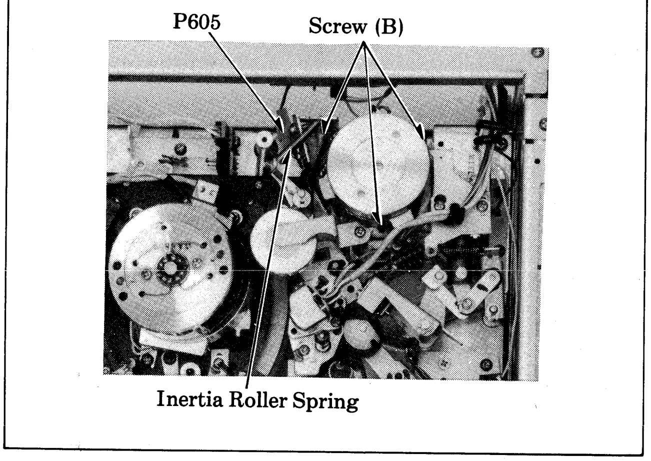


Fig. M19 Removal of Capstan Motor

6. Install the new Capstan Motor and reverse the above steps to complete the installation.

Note: Do not remove Control Gear and Motor Flywheel because they were adjusted mechanically in the factory.

6. MEASUREMENT OF TAPE SPEED AND REPLACEMENT OF CAPSTAN BELT

A. Measurement Procedure

* *Equipment Required:*

Frequency Counter

VHS Alignment Tape (VFM8080H4)

* *Specification:* 958±5Hz

1. Remove the Top Panel and the Rear Panel. (Refer to section, "DISASSEMBLY METHOD" Items 2-1 and 2-2.)
2. Connect the frequency counter to the F.G. Heads of the Capstan Motor Unit.
3. Play back the alignment tape (1kHz, Audio Portion) and wait until the tape running has well stabilized.
4. Take the read of the frequency counter and make sure that it is 958±5Hz.
5. When the tape speed is out of the specification, replace the capstan belt.

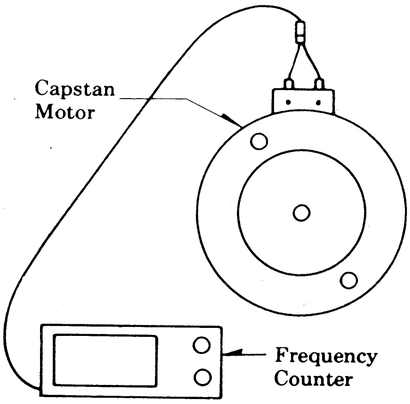


Fig. M20

B. Replacement Procedure

1. Remove the Bottom Plate and unscrew 7 red screws. (Refer to section "DISASSEMBLY METHOD", Items 2-3 and 2-9.)
2. Unscrew the 2 screws (A) and remove Thrust Holder Unit.
3. Remove the Capstan Belt and install proper belt to obtain the correct speed. (VDV0094A, VDV0094B or VDV0094C.)

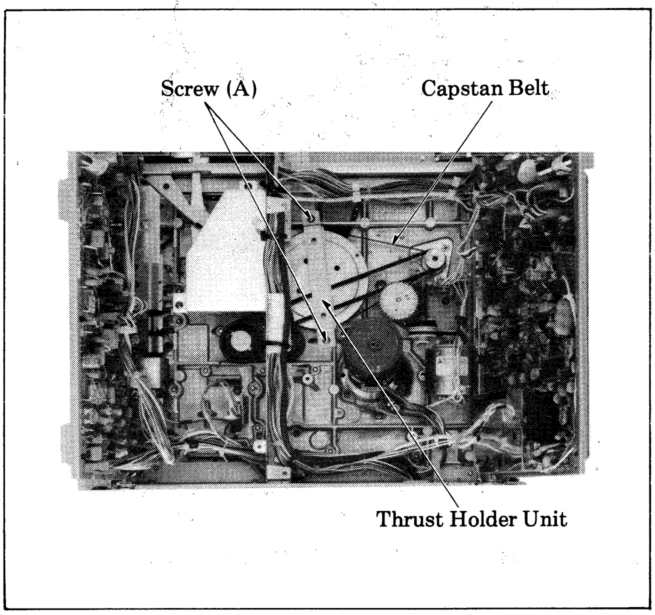


Fig. M21

Notes:

1. When tape speed is correct (958±5Hz) and in case of replacement is needed, use VDV0094B.
2. When tape speed is slower than 1 (lower than 953Hz), use VDV0094A.
3. When tape speed is faster than 1 (higher than 963Hz), use VDV0094C.

7. REPLACEMENT AND FITTING ADJUSTMENT OF CASSETTE UP HOLDER

A. Replacement Procedure

Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-6, 2-7 and 2-8.

B. Adjustment Procedure

- * *Equipment Required*
  Cassette Holder Jig (VFK0142)

1. Install the Cassette Up Holder.
2. Set the 4 screws (A) and screw them a few turns only.

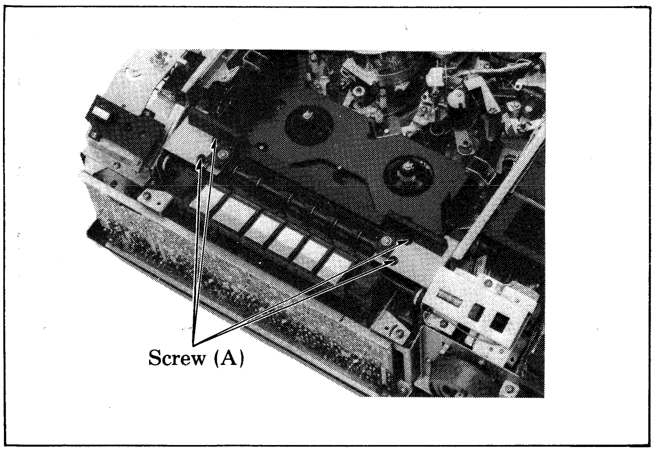


Fig. M22

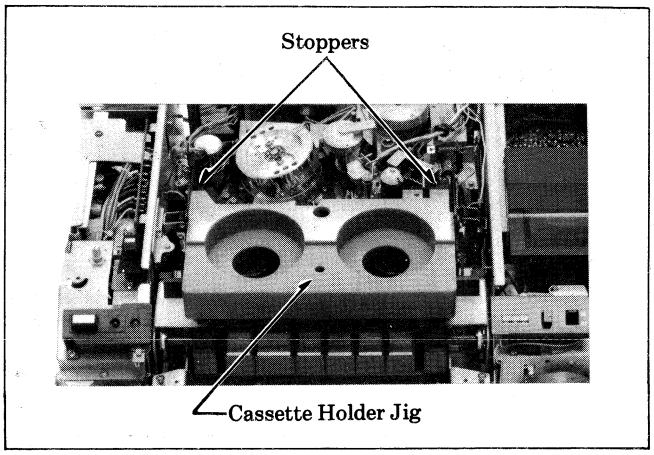


Fig. M23

3. Insert the cassette holder jig until it touches the stoppers of Cassette Up Holder.
4. While pressing the jig down until Cassette Up Holder latches, adjust the position so that it has smooth movement and correct position.
5. Tighten the 4 screws (A).
6. Press the Eject Button and make sure that it's smooth ejection.
7. Press the Cassette Up Holder down, and make sure that it's normal motion.
8. Repeat above items 6 and 7 to re-confirm.

8. MEASUREMENT AND ADJUSTMENT OF BACK TENSION

- * *Specification:* 20—25g
- * *Equipment Required*
  Back Tension Meter (Tentelometer made in the U.S.A.)
  VHS Cassette Tape

A. Measurement Procedure

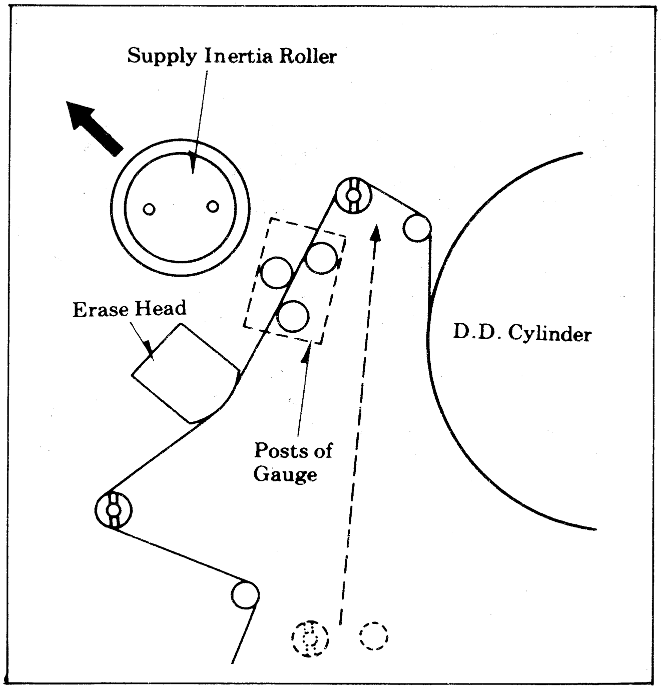


Fig. M24

1. **Remove the Top Panel and the Rear Panel. (Refer to section "DISASSEMBLY METHOD", Items 2-1 and 2-2.)**
2. Pull the Supply Inertia Roller In the direction indicated by arrow and hold it by adhesive tape.
3. Play back the cassette tape and wait until the tape running has well stabilized.
4. Set a tension meter in front of the Supply Inertia Roller and take the read of the meter.

Note: When measuring, make sure that the three posts of the meter are all in good contact with the tape, but out of contact with Supply Inertia Roller.

B. Adjustment Procedure

* *Equipment Required*

Fine Adjustment Screwdriver (VFK0136)

1. Loosen the screw (A) and set the fine adjustment screwdriver into the hole (B).
2. Move the Threading Spring Hook in either of direction indicated by arrow.
3. Upon completion of adjustment, tighten the screw (A) and remove the adhesive tape.

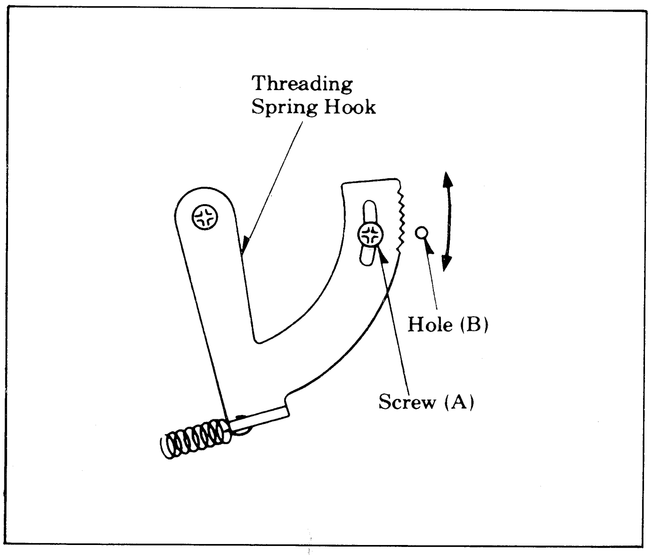


Fig. M25

9. ADJUSTMENT OF EJECT LINK CLEARANCE

* *Specification:* 0.5—1mm

* *Equipment Required*

Cassette Lock Arm Adjusting Jig (VFK0140)

A. Adjustment Procedure

1. **Remove the Top Panel, Rear Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-7 and 2-10.)**
2. Place the cassette lock arm adjusting jig, loosen the screw (A) and displace the Lever to have the clearance controlled within 0.5—1mm.
3. Upon completion of adjustment, tighten the screw (A).

Notes:

1. When adjusting, make sure that the Eject Lever is reset perfectly.
2. Upon completion of the adjustment, "FITTING ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

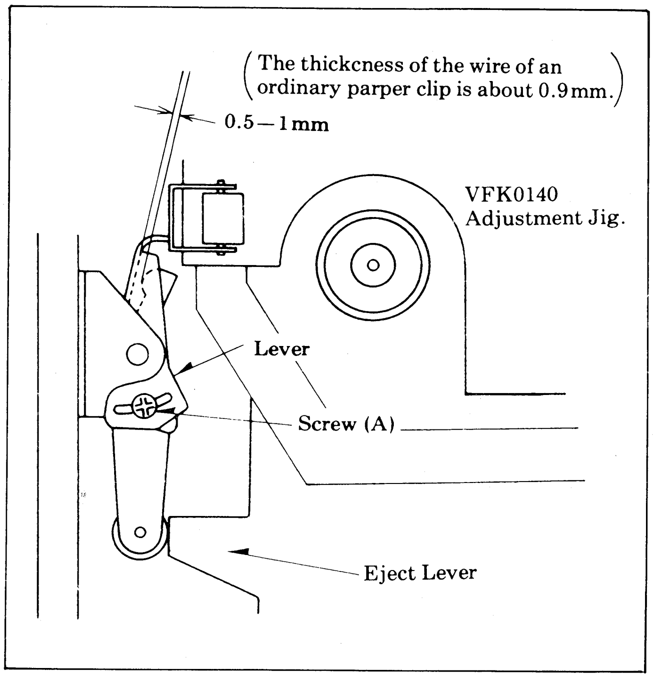

(The thickcness of the wire of an ordinary parper clip is about 0.9mm.)
0.5—1mm
VFK0140 Adjustment Jig.
Lever
Screw (A)
Eject Lever

Fig. M26

10. MEASUREMENT/ADJUSTMENT OF BRAKING FORCE AND REPLACEMENT OF BRAKE UNITS A & B

* *Specification*

Braking force: A......(450—650g-cm)
B......(70—130g-cm)
C......(65—135g-cm)

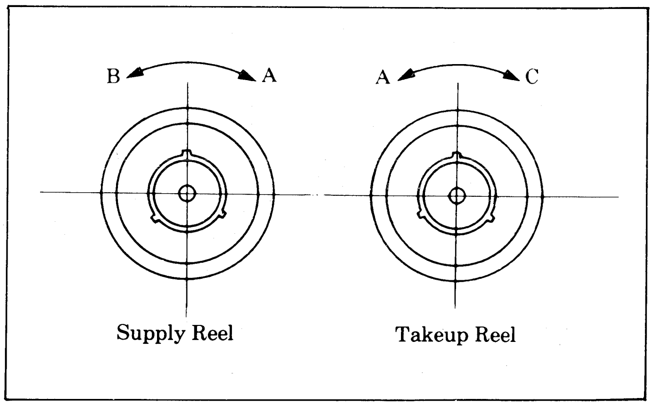


Fig. M27

A. Measurement Procedure

* *Equipment Required*

Dial Torque Gauge (VFK0133)
Adaptor (VFK0134)

1. **Remove the Top Panel, the Rear Panel and Cassette Cover. (Refer to section "DISASSEMBLY METHOD" Items 2-1, 2-2 and 2-6.)**
2. Attach the adaptor to the torque gauge.
3. Set the torque gauge to the Reel Table in STOP mode.
4. Rotate the gauge slowly in the each directions and take the read of gauge at the moment when the Reel Table begins slipping.

Note: When measuring, the weight of torque gauge should be free against the reel table.

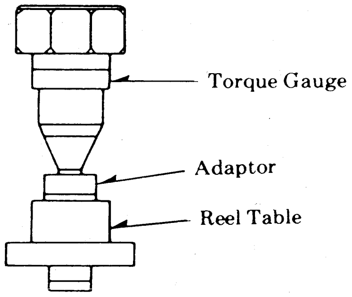

Torque Gauge
Adaptor
Reel Table

Fig. M28

B. Adjustment Procedure

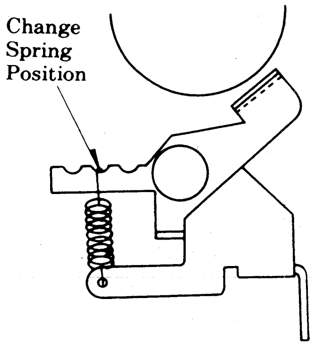

Change
Spring
Position

Fig. M29

1. For adjustment of braking force A, change the spring position, selecting the proper notch.
2. The braking forces B and C are only to be measured.

C. Replacement Procedure

* *Equipment Required*
Retaining Ring Remover—4 mm (VFK0145)
After adjustment, if it is still out of specification, then replace the Brake Unit.

1. Remove the Top Panel, Rear Panel, Cassette Guide and Cassette compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-7 and 2-10.)
2. Remove the Counter Belt A.
3. Unscrew the screw (A), remove the Shaft Guide Angle and the Eject Link Unit.
4. Unscrew the 2 screws (B) and lift the Connecting Lever with Cassette Arm A Unit, so that the Connecting Lever stands vertically.
5. Remove the Brake Arm Springs.
6. Remove the Retaining Ring (s) and one of Brake A unit and Brake B Unit which is needed replacement, or both of them.
7. Install a new Brake Unit and reverse the above steps to complete the installation.

Note: When the Brake Unit is replaced, following adjustments should be checked. (Refer to sections "FITTING ADJUSTMENT OF CASSETTE UP HOLDER" and "ADJUSTMENT OF EJECT LINK CLEARANCE" for details.)

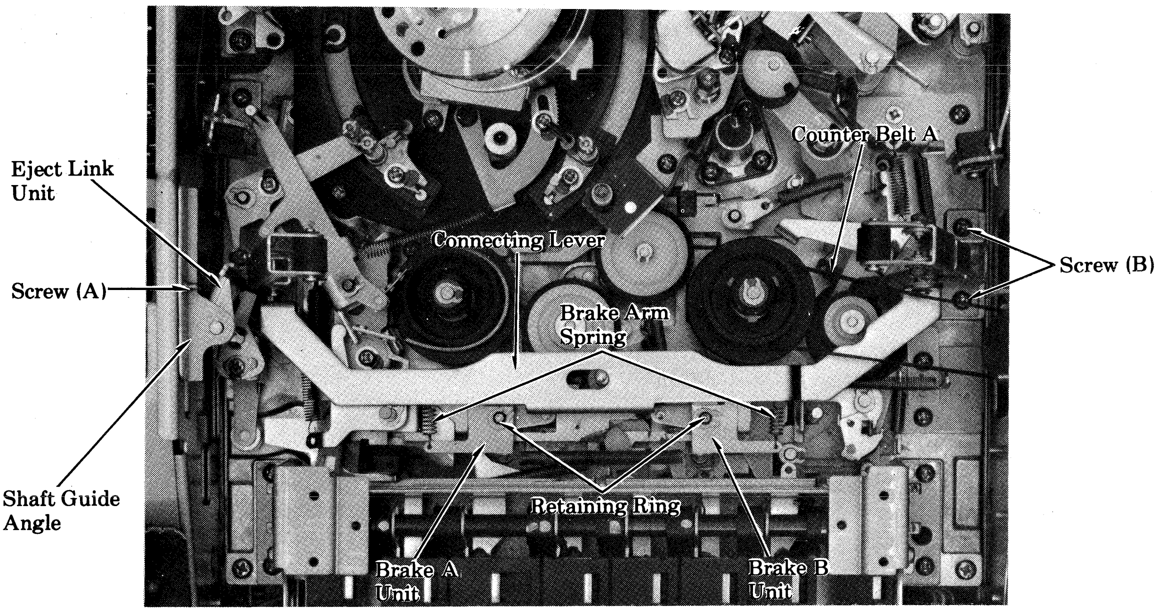

Eject Link Unit
Screw (A)
Shaft Guide Angle
Counter Belt A
Connecting Lever
Brake Arm Spring
Screw (B)
Retaining Ring
Brake A Unit
Brake B Unit

Fig. M30

11. REPLACEMENT AND ADJUSTMENT OF CASSETTE ARM UNITS A & B

A. Replacement Procedure

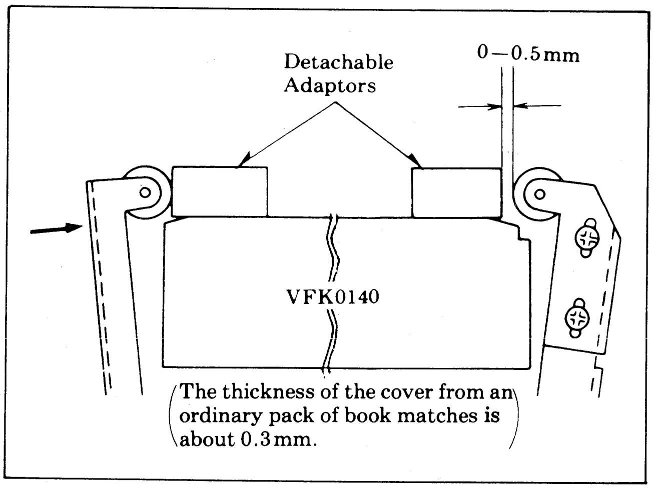
1. Remove the Top Panel, the Rear Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-7 and 2-10.)
2. Remove the Counter Belt A from the Takeup Reel Table.
3. Unscrew the screw (A), remove Shaft Guide Angle and Eject Link Unit.
4. Unscrew the 2 screws (B), 2 screws (C) and remove Connecting Lever with Cassette Arm Unit A and B.
5. Remove Retaining Ring (s) which secures Cassette Arm Unit on the Connecting Lever.
6. Remove Cassette Arm Unit A or B which is needed replacement, or both of them.
7. Install a new Cassette Arm Unit and reverse the above steps to complete the installation.

B. Adjustment Procedure

* *Equipment Required*

Cassette Arm Adjusting Jig (VFK0140)

1. Install new Cassette Arm Units, tighten 2 screws (B) and set 2 screws (C) temporarily.
2. Install the Eject Link, Shaft Guide Angle and tighten a screw (A).
3. Place the Cassette Arm Adjustment Jig with detachable adaptors.
4. Adjust the position of Cassette Arm Unit to have the specified clearance (0—0.5mm) between Roller and jig, then tighten 2 screws (C). And make sure that the condition of Cassette Arm Unit B is pushing the jig.
5. Remove the adaptor, loosen 3 screws (C), push the Cassette Arm Unit A to have its face (A), fit the jig and Roller B pressed against the jig.
6. Keep the above condition (Step 5) and tighten screws (C).


Detachable Adaptors
0—0.5mm
VFK0140

(The thickness of the cover from an ordinary pack of book matches is about 0.3mm.)

Fig. M32

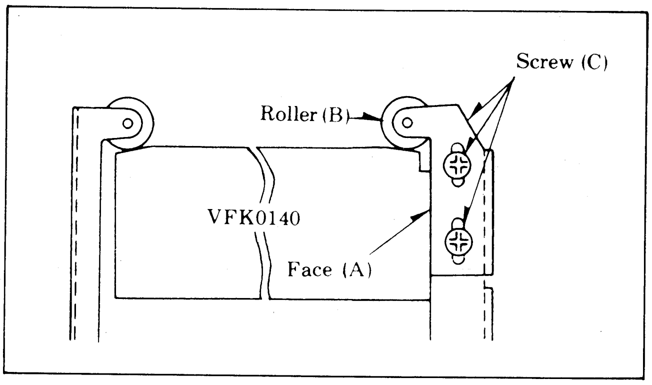

Screw (C)
Roller (B)
VFK0140
Face (A)

Fig. M33

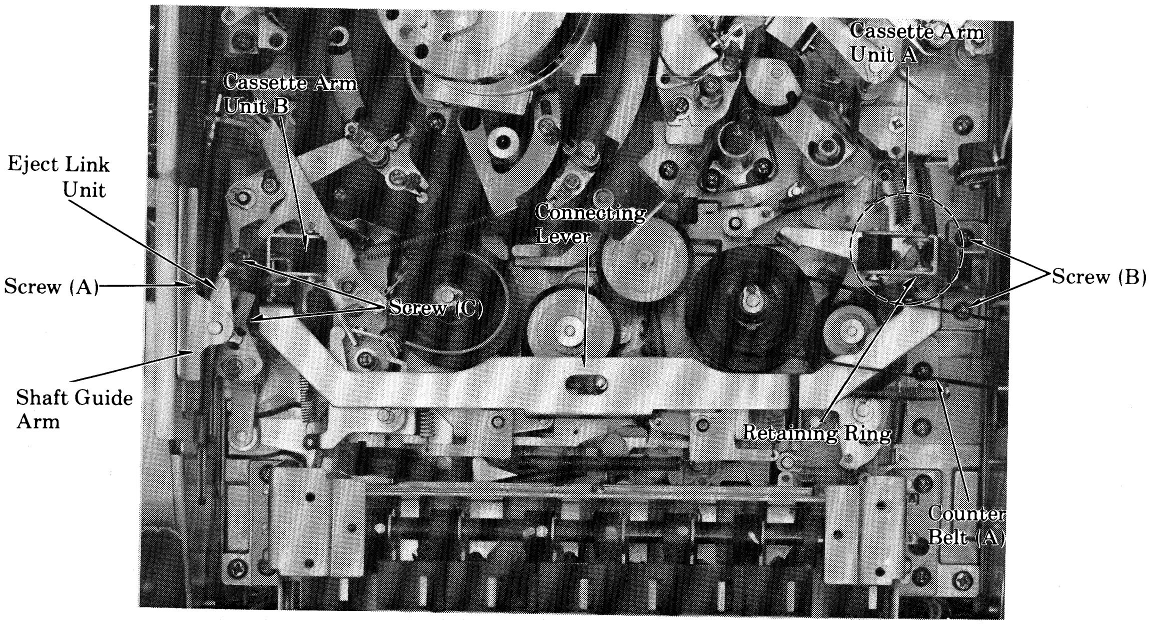

Cassette Arm Unit B
Cassette Arm Unit A
Eject Link Unit
Screw (A)
Shaft Guide Arm
Connecting Lever
Screw (C)
Screw (B)
Retaining Ring
Counter Belt (A)

Fig. M31

Note: When the Cassette Arm Units are replaced, following adjustments should be checked. (Refer to sections "FITTING ADJUSTMENT OF CASSETTE UP HOLDER" and "ADJUSTMENT OF EJECT LINK CLEARANCE" for details.)

12. REPLACEMENT AND ADJUSTMENT OF PRESSURE ROLLER UNIT.

* *Equipment Required*
Hex Wrench—1.25mm (VFK75)

A. Replacement Procedure

1. Remove the Top Panel, Rear Panel and Cassette Cover. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, and 2-6.)
2. Loosen a Hex Screw (A), remove the Pressure Roller Cap Unit, Washer and Pressure Roller Unit.
3. Install a new Pressure Roller Unit and reverse the above steps to complete the installation.

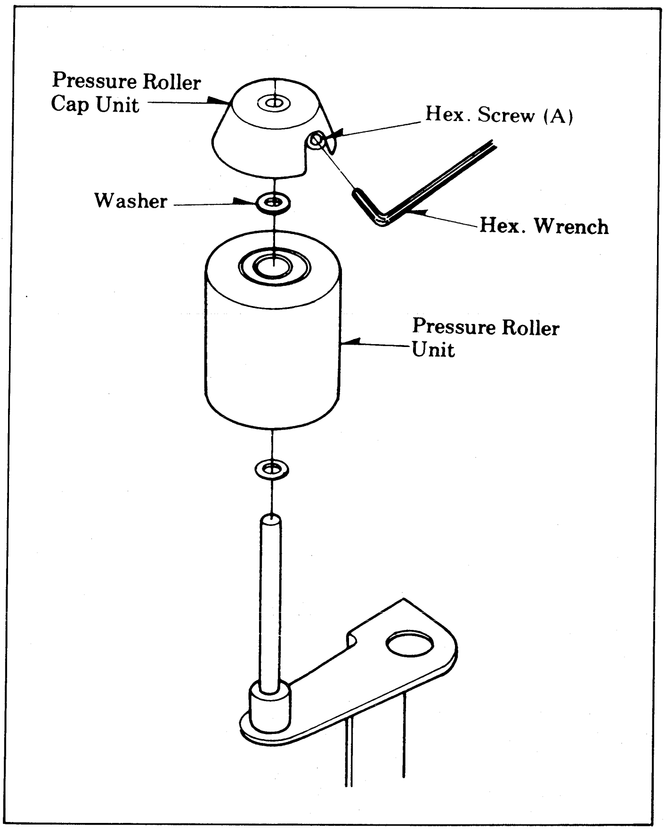


Fig. M34

B. Adjustment Procedure

1. Play back a cassette tape and check the condition of tape running at the Pressure Roller.
2. If the tape is twisted or distorted, turn the Screw (A) carefully until it becomes smooth running.

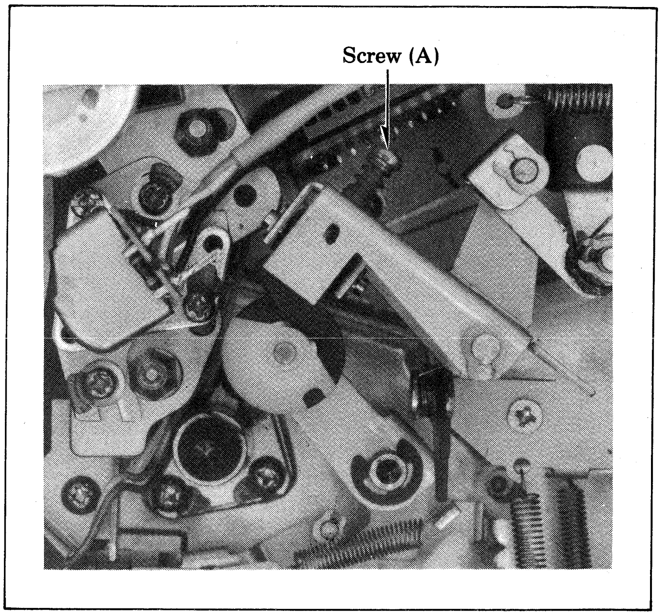


Fig. M35

13. REPLACEMENT AND ADJUSTMENT OF CAPSTAN HOLDER

A. Replacement Procedure

* *Equipment Required*
Hex. Wrench—1.25mm (VFK75)

1. Remove the Top Panel, Rear Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-7 and 2-10.)
2. Remove Pressure Roller Unit. (Refer to Section "REPLACEMENT OF PRESSURE ROLLER UNIT".)
3. Remove the Oil Cap, Oil Pool, unscrew 3 screws (A) and remove Capstan Holder.
4. Install a new Capstan Holder and reverse the above steps to complete the installation.
5. Clean the Capstan Shaft with the soft cloth.

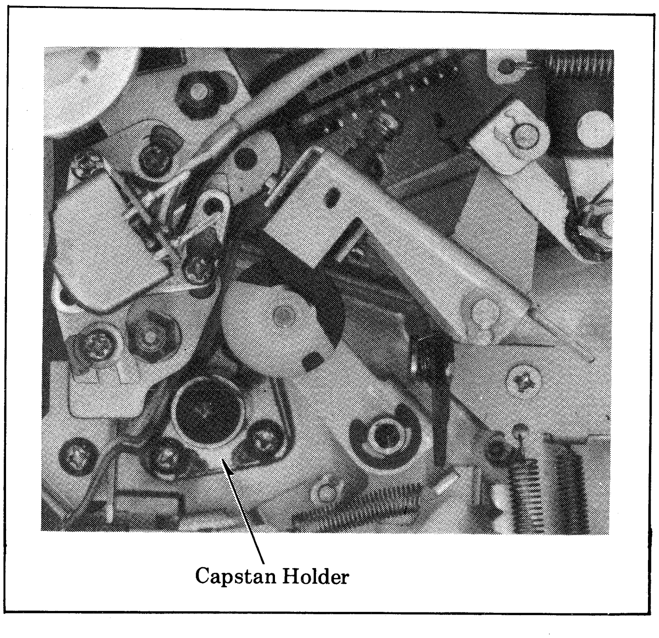


Fig. M36

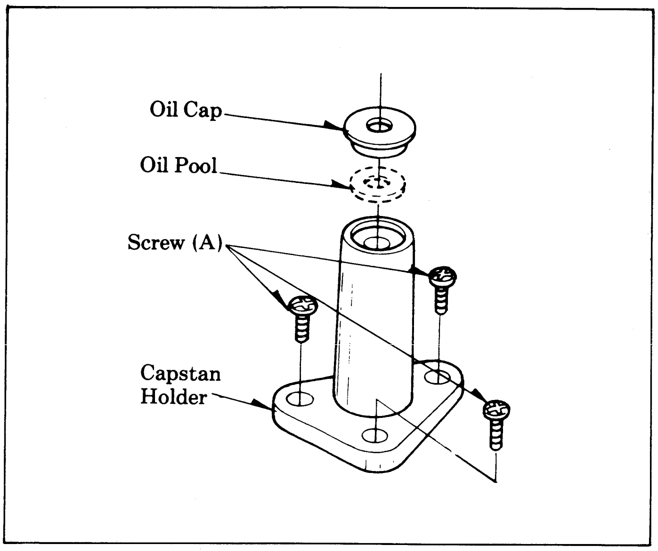

Oil Cap
Oil Pool
Screw (A)
Capstan Holder

Fig. M37

B. Adjustment Procedure

* *Equipment Required*

Capstan Reference Plate (VFK0141)

1. Install new Capstan Holder and set 3 screws (A) temporarily.
2. Place the jig, press and fit the Capstan Holder against the jig.
3. Tighten 3 screws (A).

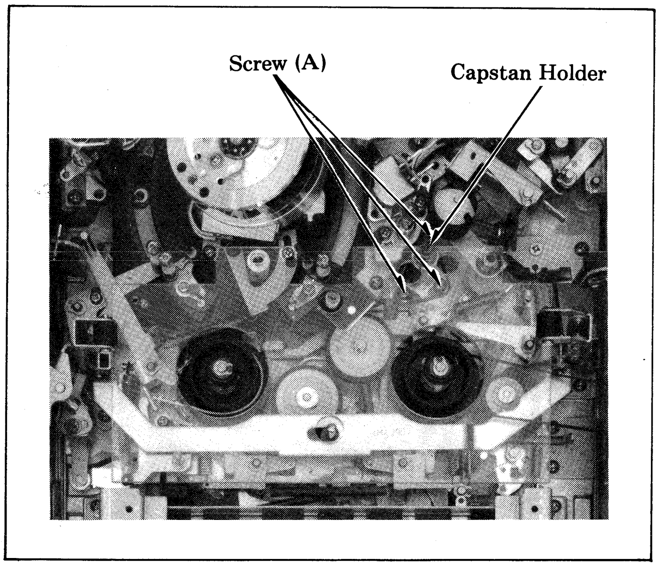

Screw (A)
Capstan Holder

Fig. M38

Note: When the Capstan Holder is replaced, following adjustments should be checked. (Refer to sections "ADJUSTMENT OF PRESSURE ROLLER UNIT" "FITTING ADJUSTMENT OF CASSETTE UP HOLDER" for details.)

14. REPLACEMENT OF PRESSURE ROLLER SOLENOID/ ADJUSTMENT OF SPRING HOOK LEVER AND CONFIRMATION OF PRESSURE FORCE

A. Replacement Procedure

* *Equipment Required:*

Retaining Ring Remover—4mm (VFK0145)

1. **Remove the Top Panel and Rear Panel. (Refer to section,** "DISASSEMBLY METHOD" Items 2-1 and 2-2.)
2. Unscrew the 3 screws (A), remove the 2 clampers (B) and Spring Hook Angle (C) with the spring.
3. Remove a Retaining Ring (D) and Connecting Lever B Unit (E).
4. Unscrew the 3 screws (F) and remove the Roller Solenoid with Bracket.
5. Unsolder the 2 lead wires (brown and white) from Solenoid.
6. Unscrew the 2 screws (G) and remove Solenoid Bracket (H). Retaining Ring (I), Rivet (J) and Solenoid Lever (K).
7. Remove the Pressure Solenoid (L).
8. Install a new Pressure Solenoid and reverse the above steps to complete the installation.

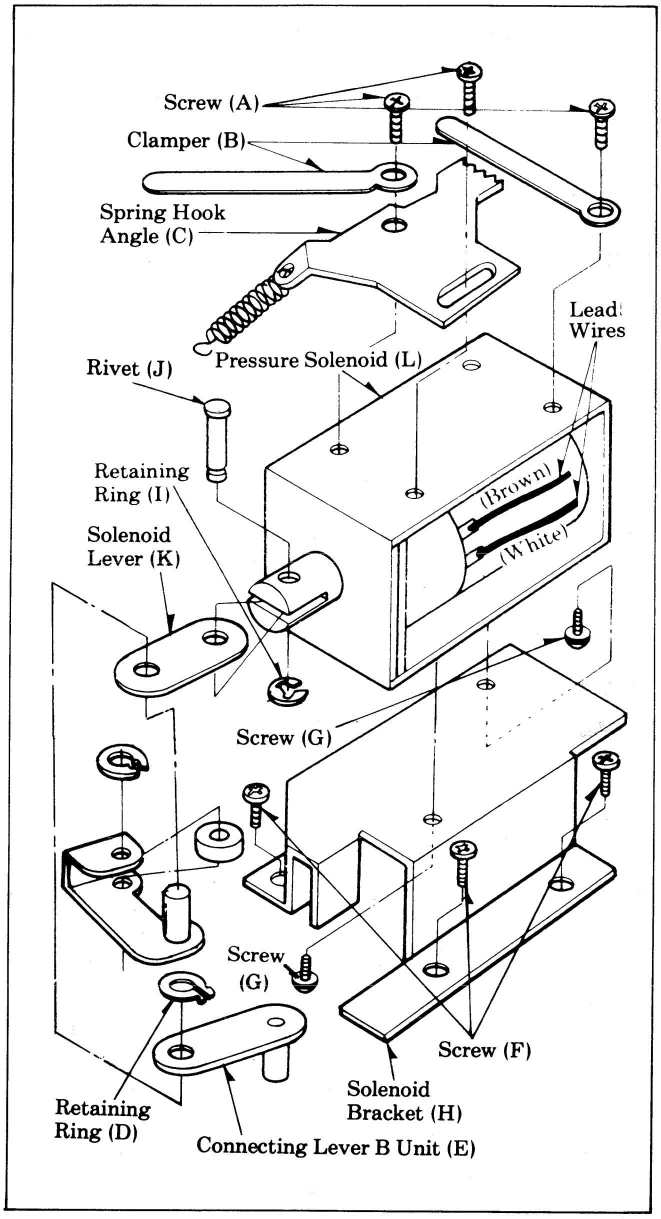

Screw (A)
Clamper (B)
Spring Hook Angle (C)
Lead Wires
Rivet (J)
Pressure Solenoid (L)
(Brown)
(White)
Retaining Ring (I)
Solenoid Lever (K)
Screw (G)
Screw (G)
Screw (F)
Solenoid Bracket (H)
Retaining Ring (D)
Connecting Lever B Unit (E)

Fig M39

B. Adjustment Procedure-1

1. Remove the Top Panel, Rear Panel, Side Panels and Front Panel. (Refer to Section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-4 and 2-5.)
2. Unscrew 6 red screws (A) and remove the Tuner block.
3. Press the Solenoid Cylinder with finger to make the PLAY mode, and adjust the screw (B) to have the proper clearance (0.2—0.5mm).

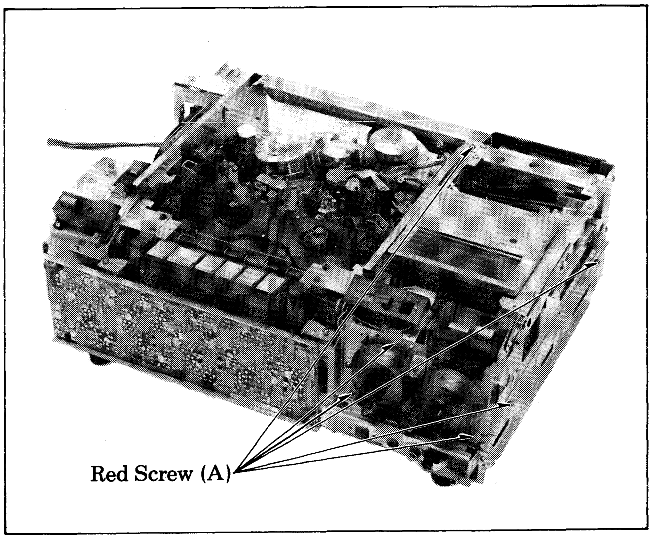


Fig. M40

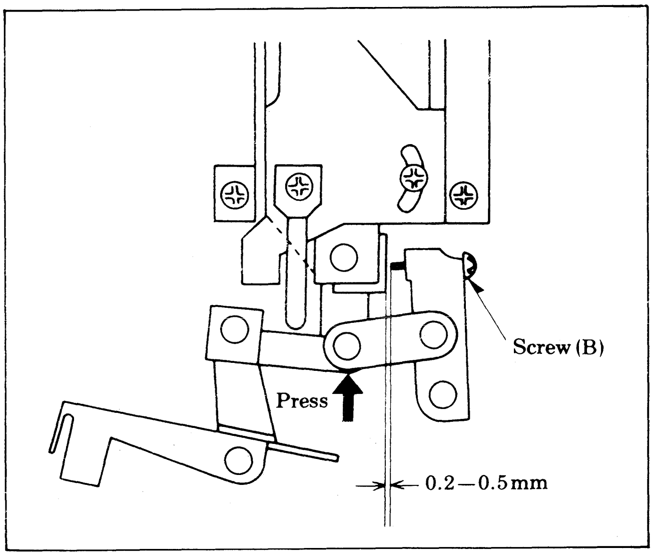

Screw (B)
Press
0.2—0.5mm

Fig. M41

C. Adjustment Procedure-2

* *Equipment Required:*
Fan-type Tension Gauge (VFK66)
Fine Adjustment Screwdriver (VFK0157)

1. Play back the Cassette Tape.
2. Set a Fan-type Tension Gauge to the part (A) of Pressure Lever.
3. Press the Lever with gauge, in the direction indicated by the arrow.
4. Confirm that the tension meter reading is 1500±150g at the moment tape stops.
5. When adjustment is needed, loosen screw (C), set the VFK1057 into the hole (D) and adjust the position by displacing the spring hook angle in the direction indicated by the arrow.

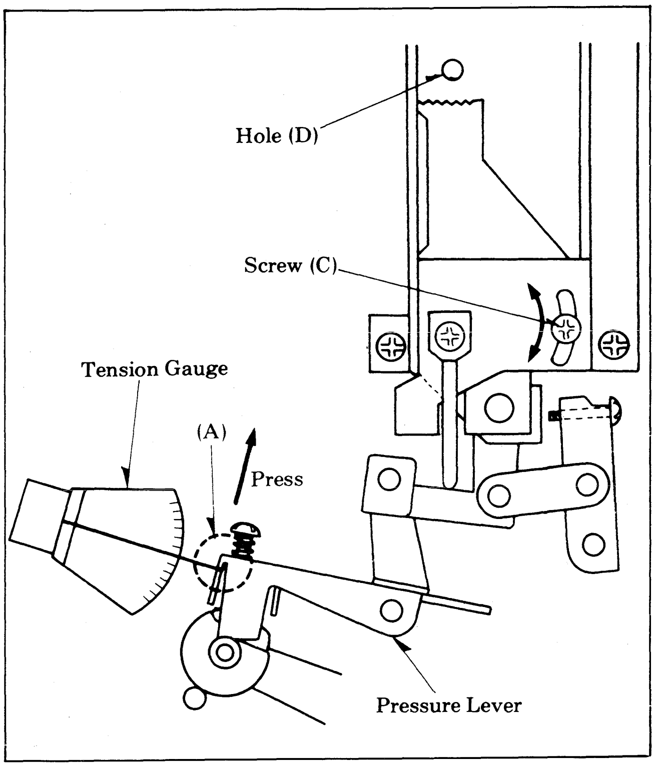

Hole (D)
Screw (C)
Tension Gauge
(A)
Press
Pressure Lever

Fig. M42

15. POSITION ADJUSTMENT OF TENSION POST AND THREADING POST

A. Measurement Procedure

* *Equipment Required:*
Ruler

1. Remove the Top Panel, Rear Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-7 and 2-10.)
2. Turn Power Switch ON.
3. Blind the Supply Photo Transistor (Q6302) with a finger, and press the PLAY button for loading.
4. As soon as loading is completed, turn power switch OFF and repress the PLAY button.
5. Make sure that the Head Cylinder stopped completely, and measure the length.

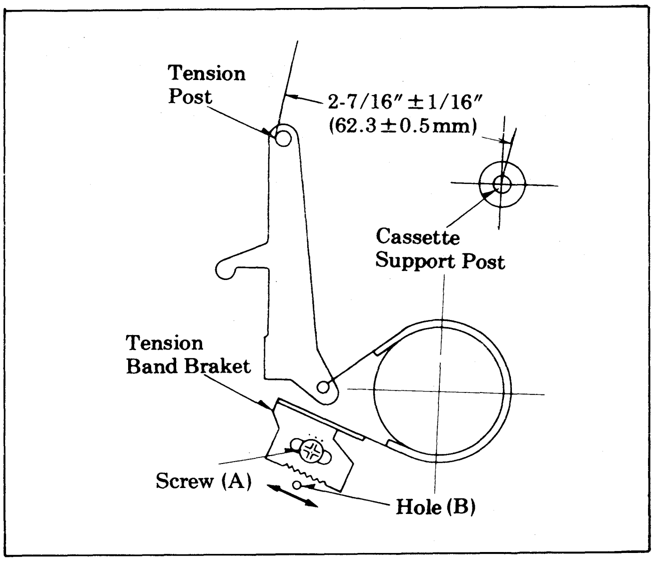

Tension Post
2-7/16″±1/16″
(62.3±0.5mm)
Cassette Support Post
Tension Band Braket
Screw (A)
Hole (B)

Fig. M43

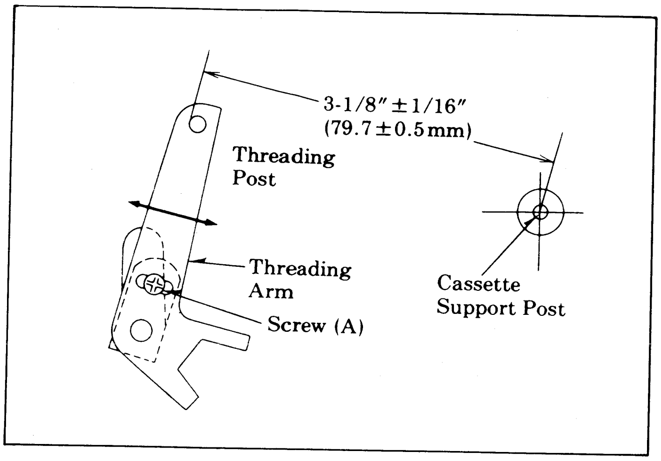

3-1/8"±1/16"
(79.7±0.5mm)
Threading Post
Threading Arm
Screw (A)
Cassette Support Post

Fig. M44

B. Adjustment Procedure

* *Equipment Required:*
Fine Adjustment Screwdriver (VFK0136)
Screwdriver (+)
(TENSION POST)

1. Remove the Counter Belt A from the Takeup Reel Table.
2. Unscrew a screw (A), remove the Shaft Guide Angle and Eject Link Unit. (Shown Fig. M45).
3. Unscrew the 2 screws (B) and lift the Connecting Lever with Cassette arm Unit A, until it stands vertically. (Shown Fig. M45).
4. Loosen the screw (A), set a fine adjustment screwdriver to the Hole (B) and adjust the position by displacing the Tension Band Bracket in the directions indicated by arrow. (Shown Fig. M43)

(THREADING POST)
Loosen the screw (A) and adjust the position by displacing the Threading Arm in the directions indicated by arrow. (Shown Fig. M44).

Notes:

1. After adjustment, play back a cassette tape and make sure that the tape does not come into contact with cassette case when it is loading.
2. Upon completion of the adjustment, "FITTING ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

16. ADJUSTMENT OF V-STOPPER POSITION

* *Equipment Required:*
V-Stopper Adjustment Jig (VFK0143)

A. Adjustment Procedure

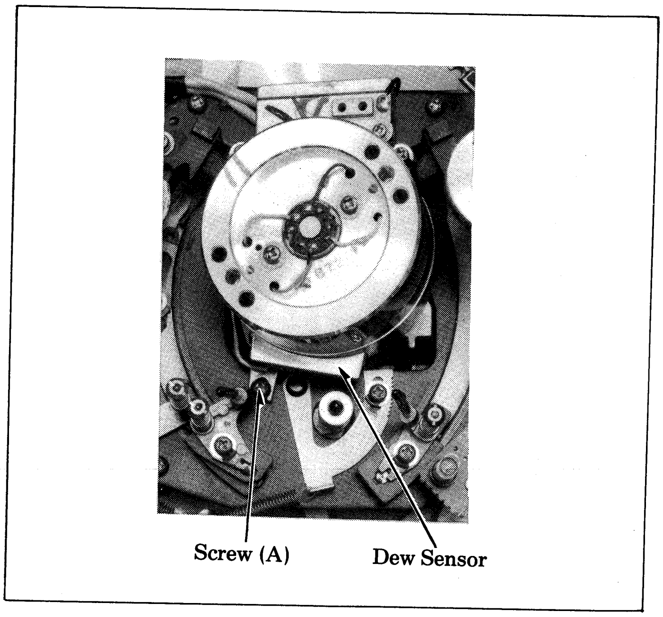

Screw (A)
Dew Sensor

Fig. M46

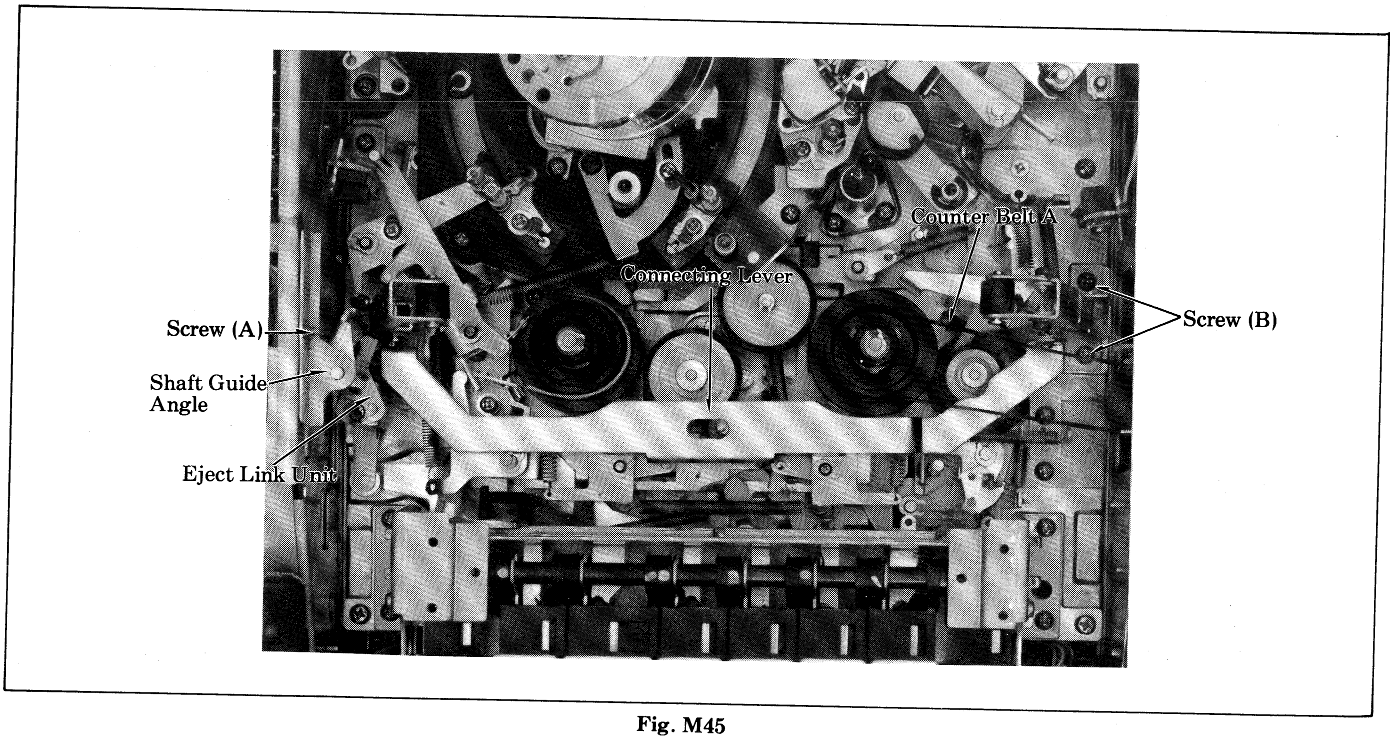

Counter Belt A
Connecting Lever
Screw (A)
Screw (B)
Shaft Guide Angle
Eject Link Unit

Fig. M45

1. **Remove the Top Panel, Rear Panel, Bottom Plate, Cassette Guide and Cassette Compartment. Unscrew the 7 red screws. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-3, 2-7, 2-10 and 2-9.)**
2. Remove the DD Cylinder Unit. (Refer to section "REPLACEMENT OF DD CYLINDER UNIT", Steps 1 to 5 of Item 2).
3. Unscrew a screw (A) and remove the Dew Sensor.
4. Pull the Supply Inertia Roller Unit and Takeup Inertia Roller Unit to the indicated directions and hold them by adhesive tape preventing them from being damaged.
5. Place the V-Stoppers Adjustment Jig in its proper position and loosen the 4 screws (B).
6. Fit the V-Stoppers snugly on the pins of the V-Stoppers Adjustment Jig.
7. Tighten the 4 screws (B).

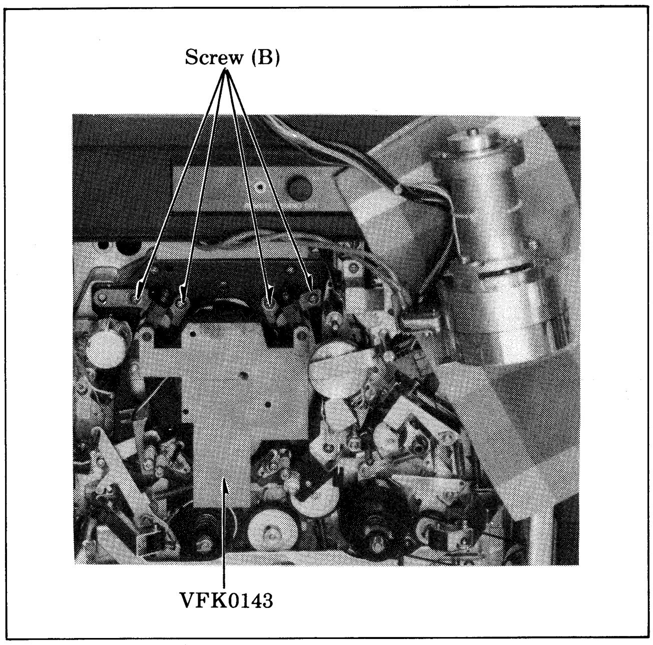


Fig. M47

Notes:
1. When adjusting, wrap D.D. Cylinder up with a soft cloth.
2. Upon completion of adjustment, remove the adhesive tape.
3. Upon completion of adjustment, "FITTING ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

17. REPLACEMENT AND HEIGHT ADJUSTMENT OF REEL TABLES

A. Replacement Procedure

* *Equipment Required:*
Retaining Ring Remover—4mm (VFK0145)
Remove the Top Panel, Rear Panel, Cassette Guide and cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-7 and 2-10.)
(TAKEUP REEL TABLE UNIT)
1. Remove the Counter Belt A.
2. Remove the Retaining Ring, Washer and the Takeup Reel Table Unit.

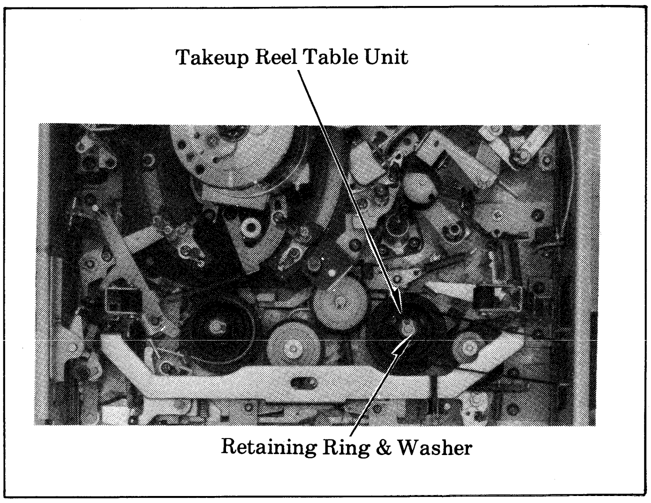


Fig. M48

(SUPPLY REEL TABLE UNIT)
1. Remove the 2 Retaining Rings and 2 Washers.
2. Remove the Tension Arm Unit from the Shaft and remove Supply Reel Table Unit.
3. Install a new Reel Table and reverse the above steps to complete the installation.

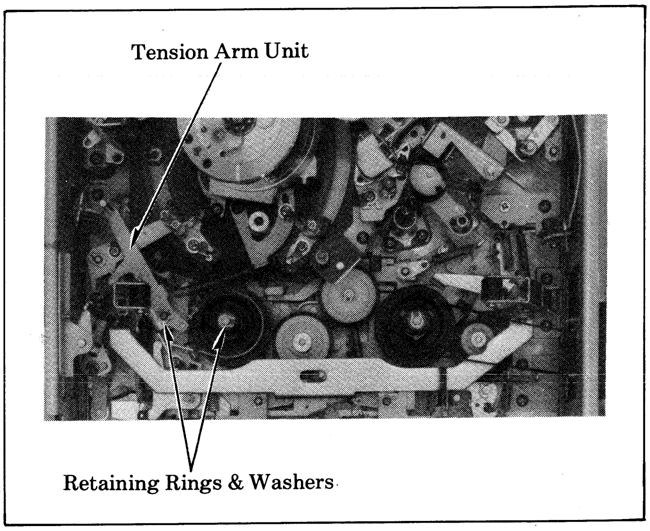


Fig. M49

Notes:
1. Do not put any oil or grease on the Counter Belt, Reel Tables, Idlers or Brake Shoes.
2. Upon completion of adjustment, "FITTING ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

B. Height Adjustment Procedure

* *Equipment Required:*
Post Adjustment Plate (VFK0138)
Reel Table Height Jig (VFK0139)
Hex. Wrench—1.5mm (VFK76)
1. Place the Post Adjustment Plate in its proper position.
2. Set the Dial Gauge into the U-shaped Block and place it on the Adjustment plate.
3. Fit the sensor of Dial Gauge on the cut-out of the adjustment plate, and set the pointer to 0 (Zero).

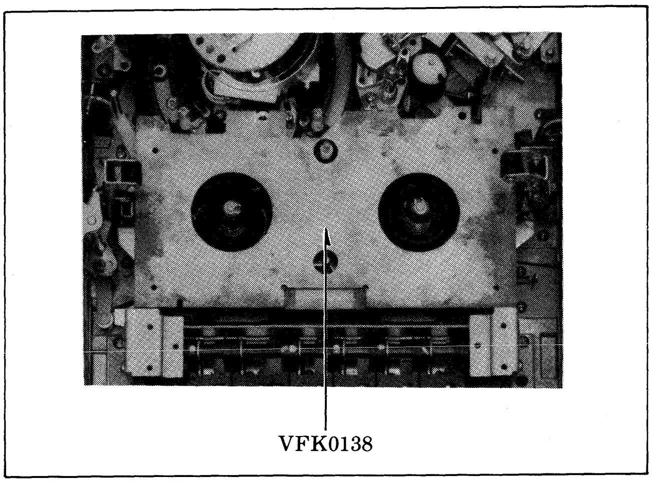


Fig. M50

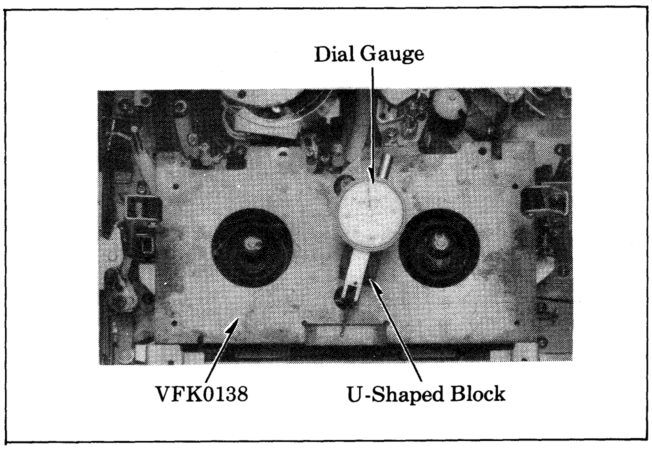

Dial Gauge
VFK0138
U-Shaped Block

Fig. M51

4. Fit the sensor of Dial Gauge on the top of Reel Table and take the reading of the gauge.
5. When the difference of the reading is more than 0.1 mm, it suggests that the adjustment is needed.
6. Change the polyslider washer.
   (The washer is available in sizes of t = 0.13 mm, 0.25 mm and 0.5 mm.)

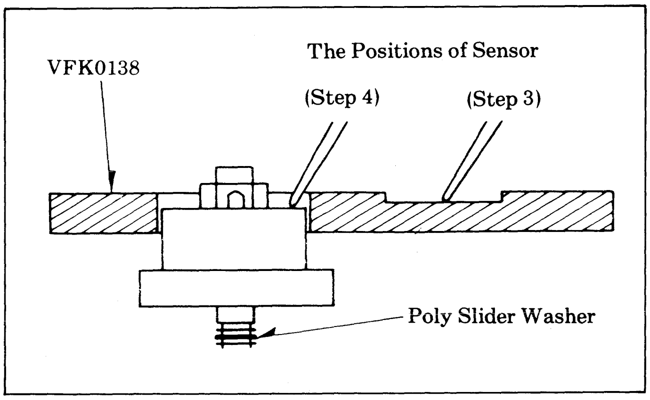

VFK0138
The Positions of Sensor
(Step 4)
(Step 3)
Poly Slider Washer

Fig. M52

Note: Upon completion of replacement and adjustment, "ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

18. CONFIRMATION OF TAKEUP FORCE

* *Specifications*

in PLAY mode......80 – 160 g-cm
in F.F. mode ...... 350 g-cm
in REW mode ...... 400 g-cm

Confirmation Procedure

* *Equipment Required:*

Dial Torque Gauge (VFK0133)
Adaptor (VFK0134)

1. Remove the Top Panel, Rear Panel and Cassette Cover. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2 and 2-6.)
2. Attach the Adaptor to the Torque Gauge.

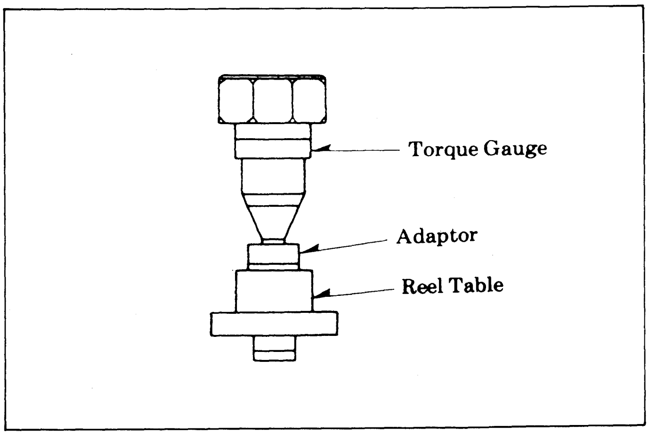

Torque Gauge
Adaptor
Reel Table

Fig. M53

3. Turn Power Switch ON.
4. Blind Photo Transistors (Q6302, Q6303) with a piece of opaque paper.
5. Set a Torque Gauge to the Reel Table, press the PLAY button, and take the read of gauge.
6. Make the same measurement for F.F. and REW modes.

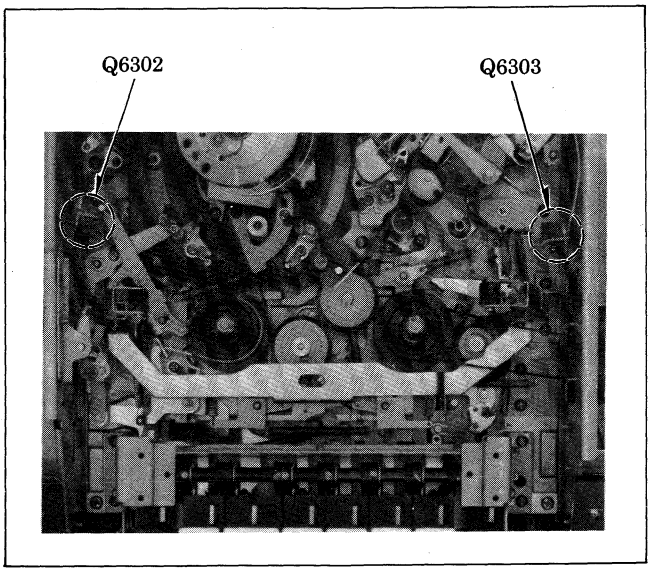

Q6302
Q6303

Fig. M54

Notes:

1. When measuring, make sure that there is no slippage between Idler and Reel Table as well as Idlers.
2. When measuring, the weight of Torque Gauge should be free against Reel Tables.
3. Remove piece of paper after adjustment.

19. ADJUSTMENT OF CASSETTE SUPPORT HIGHT

Adjustment Procedure

* *Equipment Required:*
Post Adjustment Plate (VFK0138)
Hex. Wrench—1.5mm (VFK76)

1. Remove the Top Panel, Rear Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-7 and 2-10.)
2. Place the Post Adjustment Plate to the proper position and loosen a hex screw.
3. Adjust the hight of the cassette support so that it has no clearance between the plate and cassette support, then tighten the hex screw.

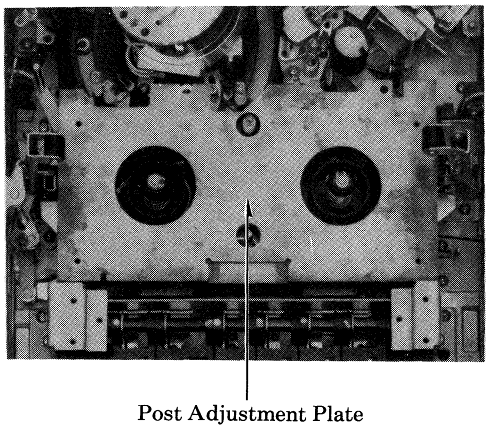


Fig. M55

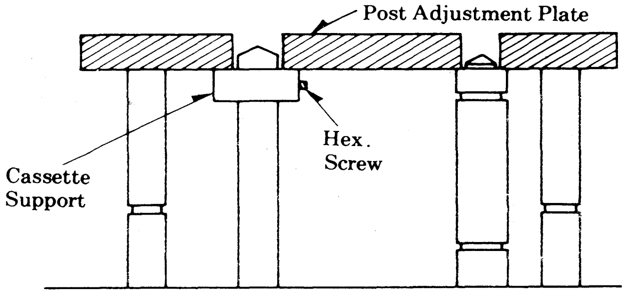


Fig. M56

Note: Upon completion of adjustment, "ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

20. ADJUSTMENT OF TAPE GUIDE POST HEIGHT

Adjustment Procedure

* *Equipment Required:*
Post Adjustment Plate (VFK0138)
Post Adjustment screwdriver (VFK0137)
Block Gauge (VFK0139)
Make fine adjustment of posts 1 & 4, also make pre-adjustment of posts 2 & 3.

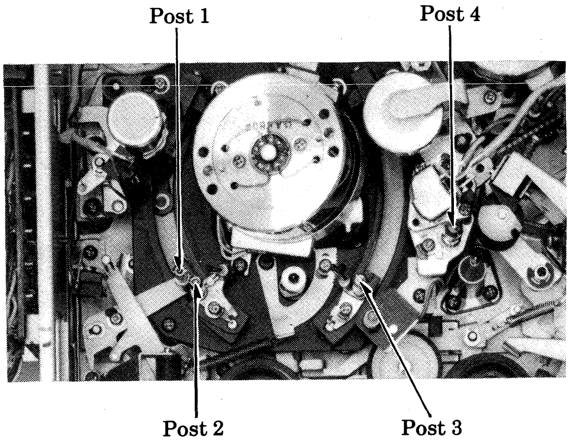


Fig. M57

1. Remove the Top Panel, Rear Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-7 and 2-10.)
2. Place the Post Adjustment Plate to the proper position and put the Block Gauge on it.

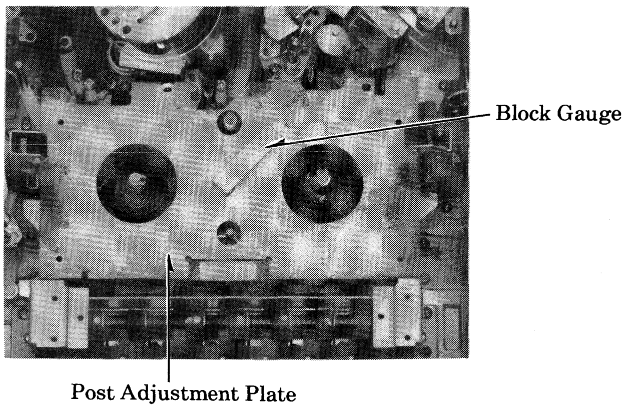


Fig. M58

3. Fit the block gauge against each post. (Shown in Fig. M59).
4. Loosen the locking hex screws of posts, then turn the top of post-1, post-2 and post-3 with post adjustment screwdriver. (Shown in Fig. M60).
5. Adjust the post-4 with the box drive. And when the post-4 is adjusted, also turn nut (D) as the same turns as nut (C) was turned, to keep A/C head base unit in horizontal level. (Shown in Fig. M61).

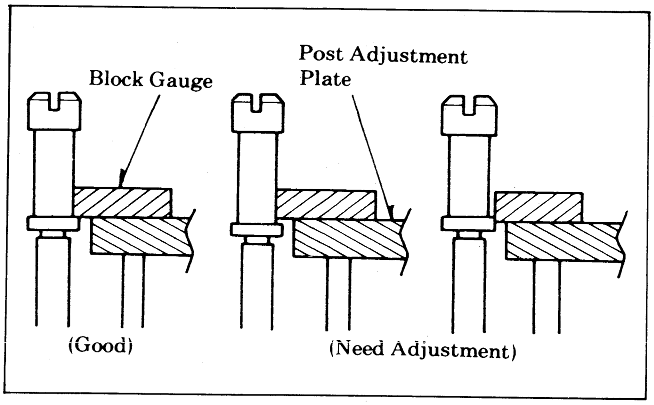

Block Gauge
Post Adjustment Plate
(Good)
(Need Adjustment)

Fig. M59

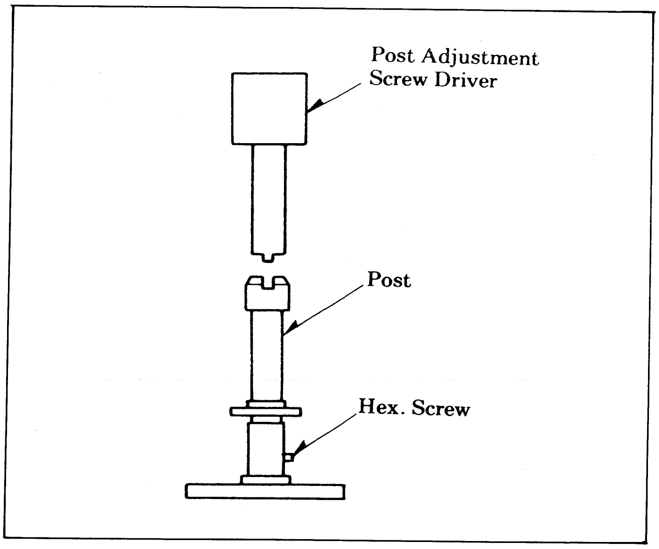

Post Adjustment Screw Driver
Post
Hex. Screw

Fig. M60

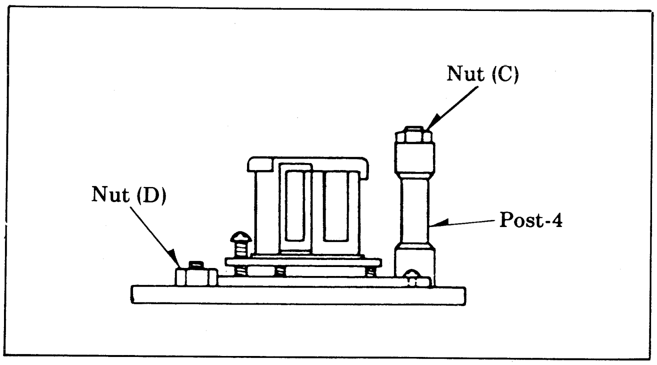

Nut (C)
Nut (D)
Post-4

Fig. M61

Note:

1. Upon completion of adjustment, "ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

21. REPLACEMENT OF BUTTON UNIT AND EACH BUTTON

Replacement Procedure

1. Remove the Top Panel, Rear Panel, Side Panels, Front Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-4, 2-5, 2-7, and 2-10.)
2. Unscrew the 4 screws (A) on the Regulator & Transport Board, also disconnect the 5 connecting plugs and remove the Board.

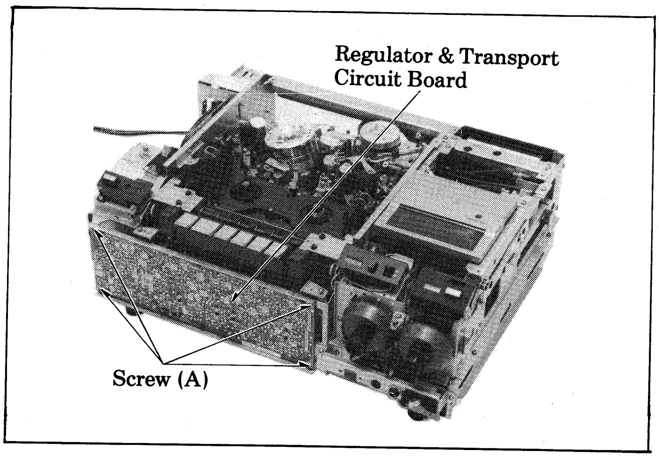

Regulator & Transport Circuit Board
Screw (A)

Fig. M62

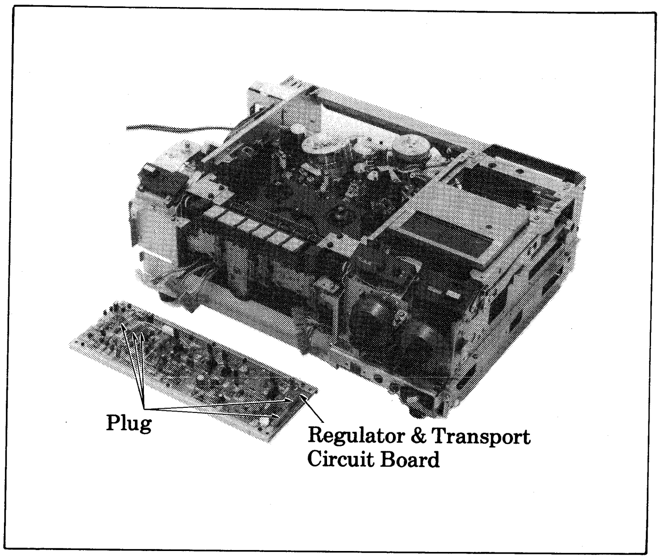

Plug
Regulator & Transport Circuit Board

Fig. M63

3. Unscrew the 4 screws (A) securing the Button Unit, remove the Button Unit from chassis and unsolder 2 lead wires from the Stop Solenoid.
4. Unscrew the 4 screws, remove the Button Frame Holder A and B, Button Slide Lever, Button Slide Lever A and Buttons with Button Shaft. (Refer to "EXPLODED VIEW" No. 4, Button Unit Break Down).

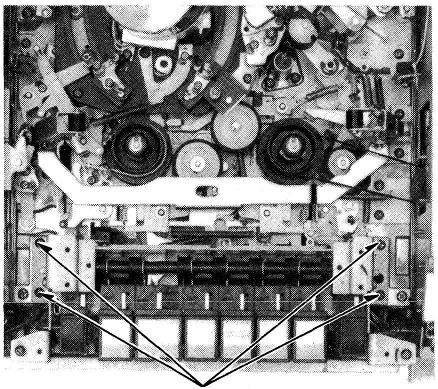


Fig. M64

5. Remove the each Button that the replacement is needed.
6. Install a new button and reverse the above steps to complete the installation.

Note: Upon completion of adjustment, "ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

22. REPLACEMENT OF TIMER UNIT

Replacement Procedure

1. Unscrew the 2 screws (A).
2. Unplug the connection plug and remove the Timer Unit.
3. Install a new Timer Unit and reverse the above steps to complete the installation.

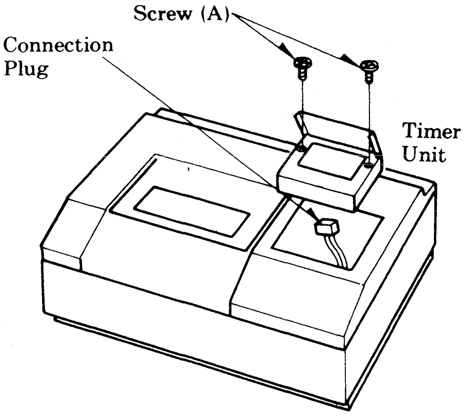

Screw (A)
Connection Plug
Timer Unit

Fig. M65

23. REPLACEMENT OF TAPE COUNTER

Replacement Procedure

1. Remove the Top Panel, Rear Panel, Side Panels, and Front Panel. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-4, and 2-5.)
2. Unscrew the 6 red screws (A) and remove the Tuner Block.
3. Unscrew the 2 screws (B) and remove Counter Cover.

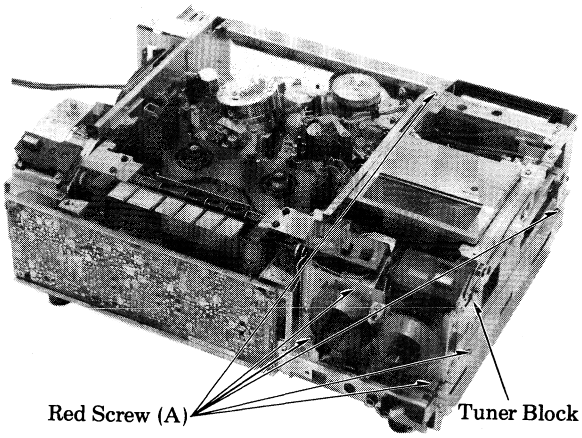

Red Screw (A)
Tuner Block

Fig. M66

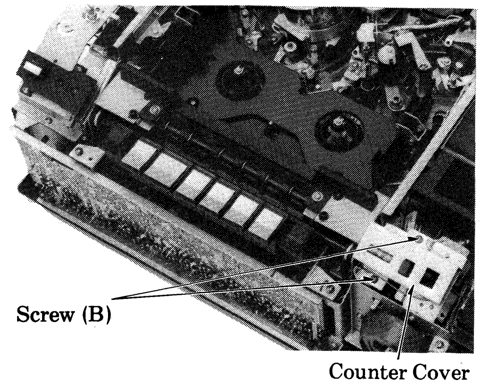

Screw (B)
Counter Cover

Fig. M67

4. Unsolder the 2 lead wires from the Counter, and take off Counter Belt B from the Counter Pulley.
5. Unscrew the 2 screws (C) and remove counter chassis.
6. Unscrew the 2 screws (D) securing the Tape Counter to the counter chassis, and remove the Tape Counter.
7. Install a new Tape Counter and reverse the above steps to complete the installation.

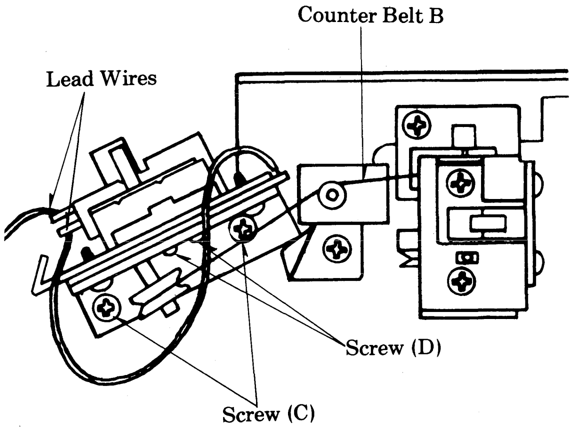

Counter Belt B
Lead Wires
Screw (D)
Screw (C)

Fig. M68

24. REPLACEMENT OF COUNTER BELTS (A & B)

Replacement Procedure

1. Remove the Top Panel, Rear Panel, Side Panels, Front Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items, 2-1, 2-2, 2-4, 2-5, 2-7 and 2-10).
2. Unscrew the 6 red screws (A) and disconnect the 2 connectors and a pin jack connected to the Tuner Block. Then remove the Tuner Block.

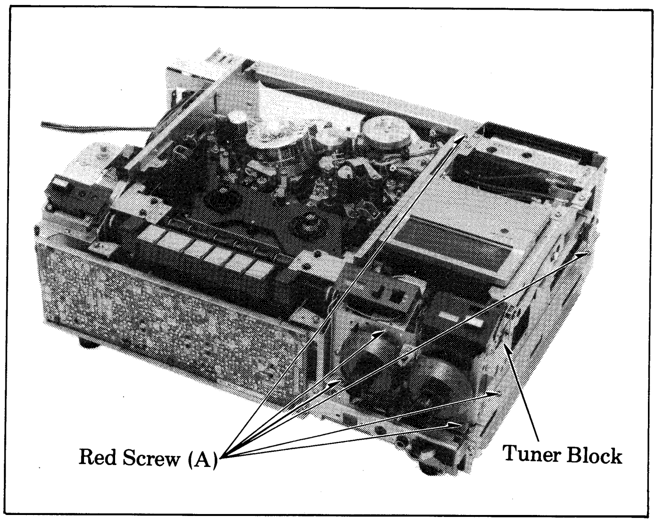


Fig. M69

3. Take off the Counter Belt A from the Takeup Reel Table.

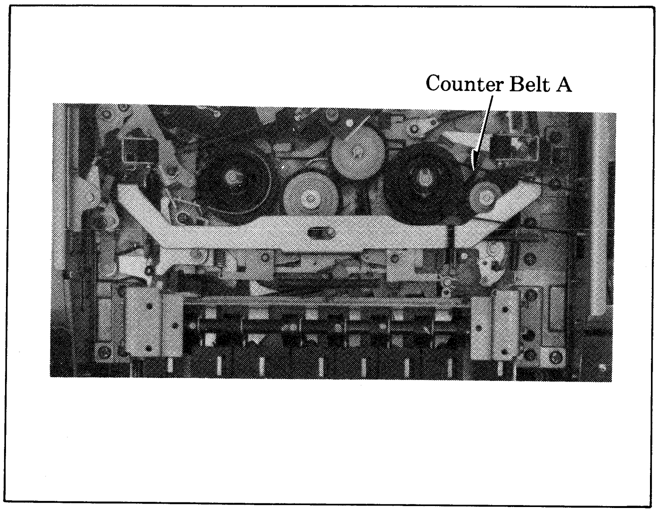


Fig. M70

4. Disconnect the connector (P614) from the Takeup Detector P.C. Board. And take off the Counter Belt B from the Tape Counter Pulley. Unscrew a screw (B) and remove the Reel Sensor Unit with Counter Belts A & B.

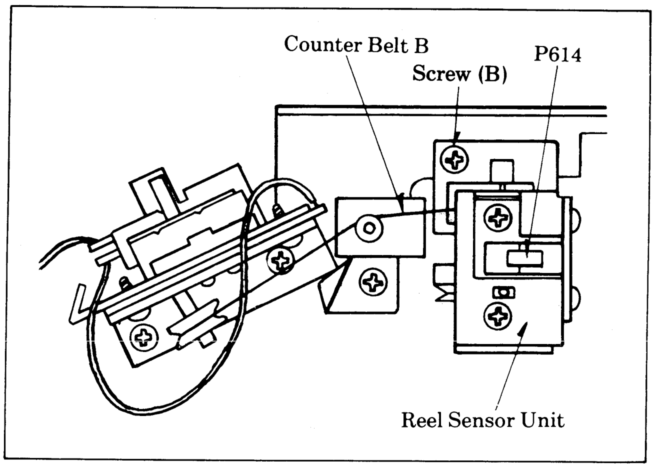


Fig. M71

5. Disassemble the Reel Sensor Unit and remove the Counter Belt A or Counter Belt B which is needed or both of them. (For detailes, refer to "EXPLODED VIEW" No. 7, Chassis Frame Section-2).
6. Install the new belt (s) and reverse the above steps to complete the installation.

Notes:

1. When reassemble the Reel Sensor Unit, make sure the clearance between the Connecting Pulley Unit and Hall IC (IC6301) is less than 0.5mm.
2. Upon completion of replacement, "ADJUSTMENT OF CASSETTE UP HOLDER" also shoud be checked.

25. REPLACEMENT OF REEL BELTS A, B AND CAPSTAN BELT

Replacement Procedure

When replacing Reel Belt A, follow the steps 1 to 4.
When replacing Reel Belt B, follow the steps 1 to 3.
When replacing Capstan Belt, follow the steps 1 to 6.

1. Remove the Bottom Plate and unscrew the 7 red screws. (Refer to section "DISASSEMBLY METHOD", Items 2-3 and 2-9.)
2. Unscrew the 2 screws (A) and remove the Shield Cover.
3. Remove the Reel Belt B.
4. Remove the Reel Belt A.
5. Unscrew the 2 screws (B) and remove Thrust Holder Unit.
6. Remove the Capstan Belt.
7. Install a new belt and reverse the above corresponding steps to complete the installation.

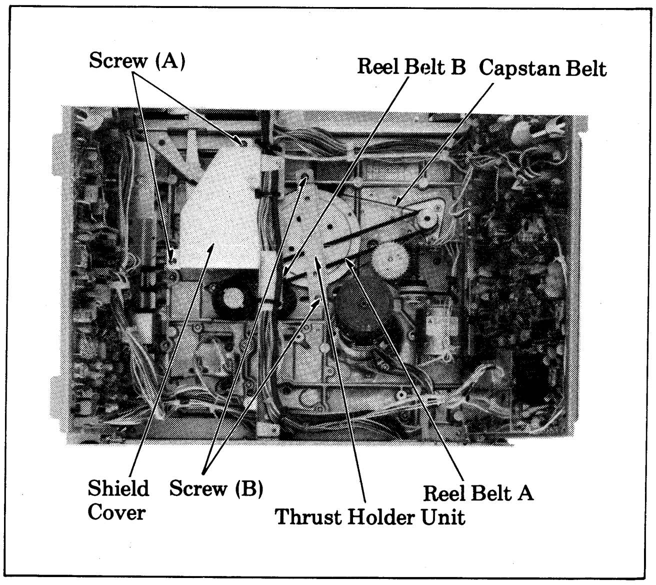


Fig. M72

Notes:

1. Do not put any oil or grease on the Belts or Pulleys.
2. Make sure that installed belts are not twisted.

26. REPLACEMENT OF LOADING BELT AND LOADING MOTOR PULLEY UNIT

Replacement Procedure

* *Equipment Required:*
Hex. Wrench—2.6mm (VFK48)
When replacing Loading Belt, follow the steps 1 to 2.
When replacing Motor Pulley, follow the steps 1 to 5.

1. Remove the Bottom Plate and unscrew the 7 red screws. (Refer to section "DISASSEMBLY METHOD", Items 2-3 and 2-9.)
2. Remove the Loading Belt.
3. Unsolder the 2 lead wires (gray and pink) from the Motor.

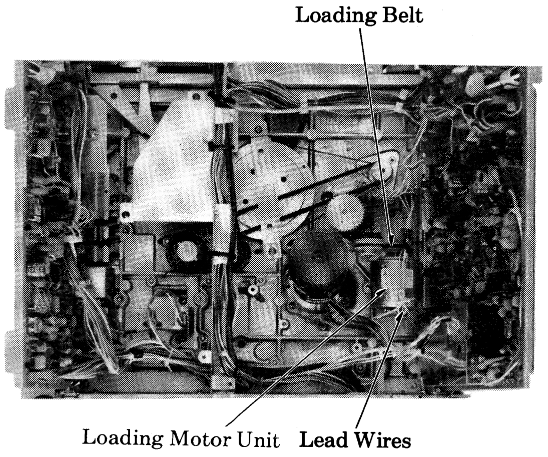


Fig. M73

4. Unscrew the 2 hex. screws (A) and loosen the hex screw (B).
5. Remove the Loading Motor Pulley Unit from the Loading Gear Bracket.
6. Remove the hex. screw (B) from the Motor Pulley Unit and put it into the new Motor Pulley Unit.
7. Install a new Loading Motor Pulley Unit and reverse the above steps to complete the installation.

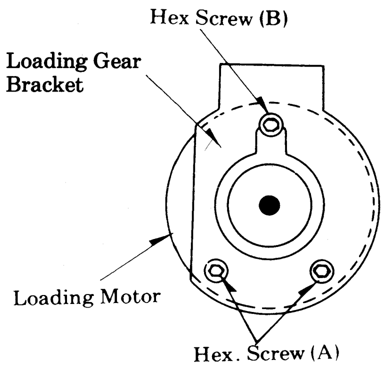


Fig. M74

27. REPLACEMENT AND POSITION ADJUSTMENT OF TAPE SLACK SWITCH

A. Replacement Procedure

1. Remove the Bottom Plate and unscrew the 7 red screws. (Refer to section "DISASSEMBLY METHOD", Items 2-3 and 2-9.)
2. Set the unit vertically so that the left side board is facing down.
3. Carefully disconnect the connecting plug (P613) from Micro Switch Connection Board.

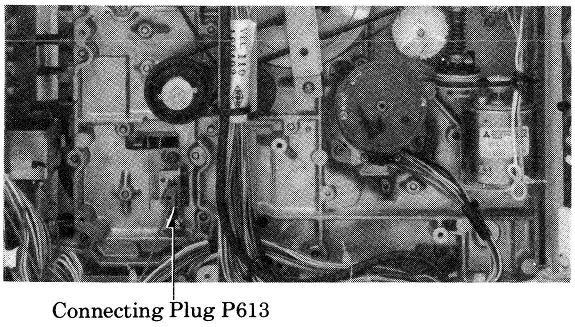


Fig. M75

4. Loosen the screw (A) a few turns only, unscrew the screw (B) and remove the Tape Slack Switch.
5. Install new Tape Slack Switch and reverse the above steps to complete the installation.

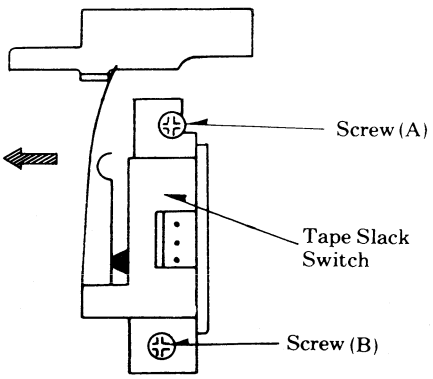


Fig. M76

B. Adjustment Procedure

This switch should turn ON at the moment when the PLAY Button latches.

1. Place the switch in its proper position and mount the screw (A) and screw (B) temporarily.
2. Press the PLAY Button down and lock it.
3. Displace the Tape Slack Switch in the direction indicated by the arrow, and tighten both screws at the Slack Switch turns ON. (Shown in Fig. M76).
4. Make sure that the unit begins loading when Power Switch is turned ON with PLAY Button pressed.

28. REPLACEMENT OF SUPPLY INERTIA ROLLER UNIT

Replacement Procedure

* *Equipment Required:*
Retaining Ring Remover—4mm (VFK0145)

1. Remove the Top Panel and the Rear Panel. (Refer to section "DISASSEMBLY METHOD", Items 2-1 and 2-2.)
2. Remove the Inertia Roller Spring.
3. Remove Retaining Ring and Supply Inertia Roller Unit.
4. Install a new Roller Unit and Reverse the above steps to complete the installation.

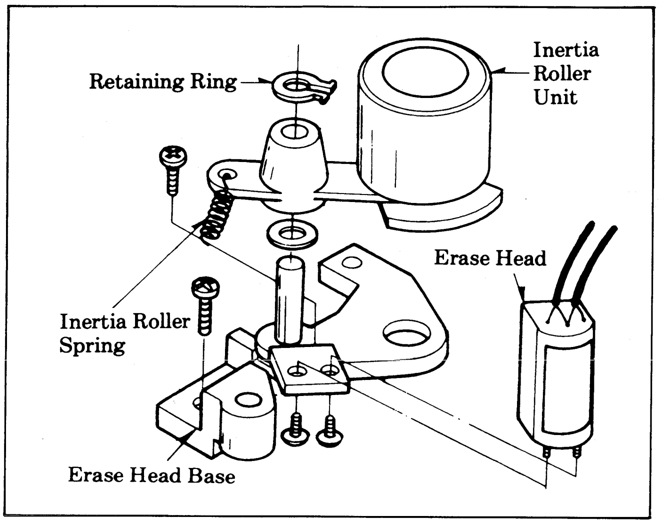

Retaining Ring
Inertia Roller Unit
Erase Head
Inertia Roller Spring
Erase Head Base

Fig. M77

29. REPLACEMENT OF TAKEUP INERTIA ROLLER UNIT

Replacement Procedure

* *Equipment Required:*
Retaining Ring Remover—4 mm. (VFK0145)

1. Remove the Top Panel and Rear Panel. (Refer to section "DISASSEMBLY METHOD", Items, 2-1 and 2-2.)
2. Loosen a screw (A) and turn the Guard Angle.
3. Remove the Retaining Ring and take off the Inertia Roller Spring.
4. Then remove the Takeup Inertia Roller Unit by pulling it up.

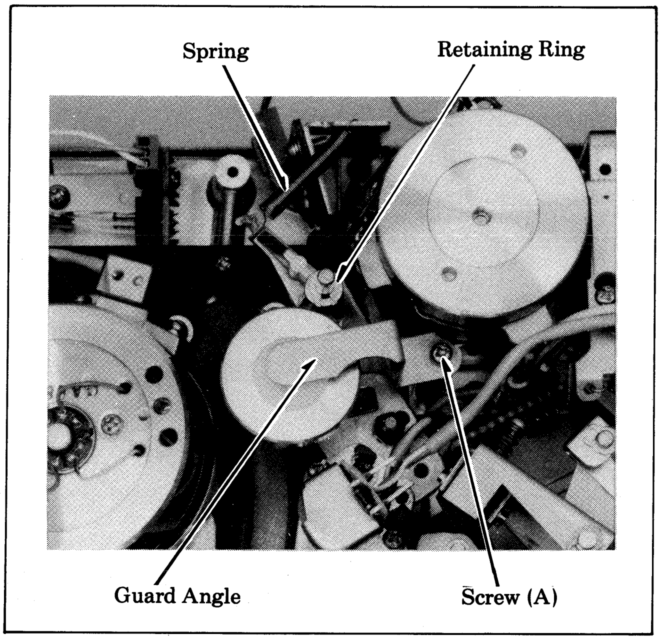

Spring
Retaining Ring
Guard Angle
Screw (A)

Fig. M78

5. Install a new Roller Unit and reverse the above steps to complete the installation.

30. TAPE INTERCHANGEABILITY ADJUSTMENT

* *Equipment Required:*
Alignment Tape (VFM8080H4)
Post Adjustment Screwdriver (VFK0137)
Eccentric Screwdriver (VFK0135)
Hex. Wrench—0.9 mm (VFK0146)
Hex. Wrench—1.5 mm (VFK76)

A. Pre-adjustment for Posts and Audio/Control Head Height

To prevent the alignment tape from being damaged, use a normal cassette tape for the pre-adjusting procedure.

1. Play back a cassette tape and make sure that the edges of the posts P-1, P-2 and P-3.

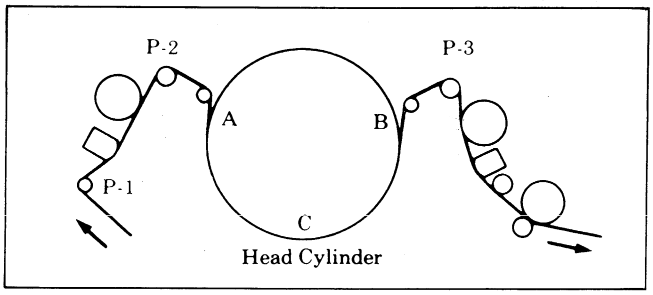

P-2
P-3
A
B
P-1
C
Head Cylinder

Fig. M79

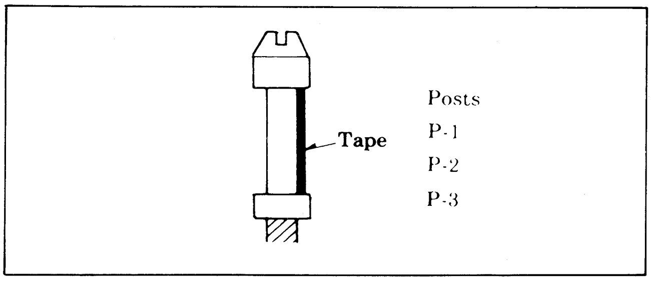

Tape
Posts
P-1
P-2
P-3

Fig. M80

2. If curling is apparent, adjust each post as shown in Fig. M81 Fig. M82.

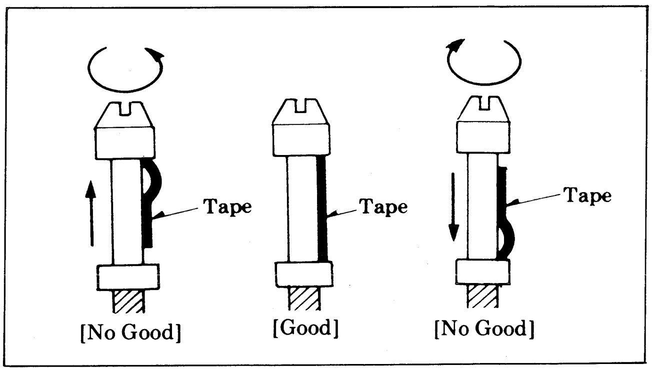

Tape
Tape
Tape
[No Good]
[Good]
[No Good]

Fig. M81

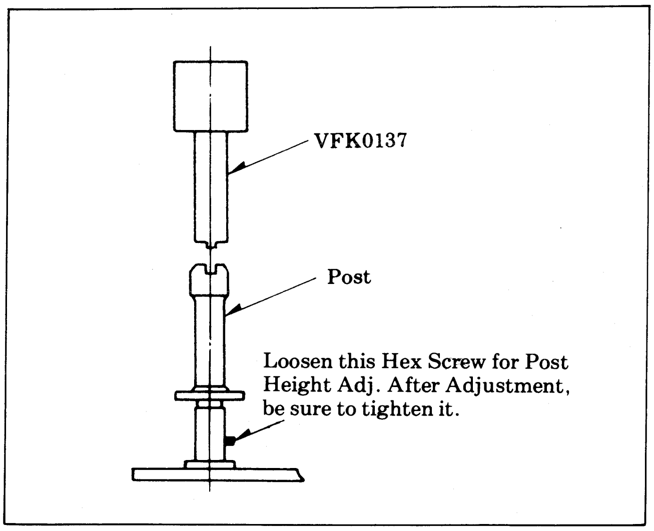

VFK0137
Post
Loosen this Hex Screw for Post Height Adj. After Adjustment, be sure to tighten it.

Fig. M82

3. Adjust the two screws (A) and the screw (B) so that the Audio/Control Head height becomes as shown in Fig. M84.

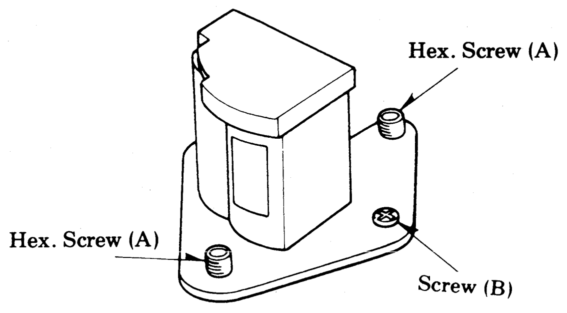

Hex. Screw (A)
Hex. Screw (A)
Screw (B)

Fig. M83

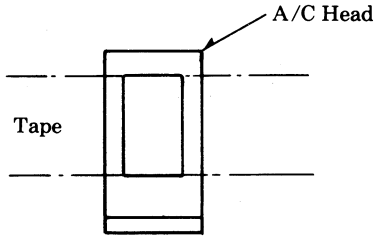

A/C Head
Tape

Fig. M84

B. **Tape Interchangeability Adjustment**

- Connect an oscilloscope to TP6304 on the Test Point Board.
- Play back the monoscope portion of the alignment tape VFM8080H4.

B-1. Tape Crease and Slack Adjustment

1. Watch the portions between Post P2 and A, and between Post P3 and B carefully.
2. If tape crease or slack is appearing at the portion, adjust the position of the inclined base. To adjust it, loosen the screw (A) slightly, set the eccentric screwdriver (VFK0135) to the hole (B) and move the base as shown in Fig. M85.

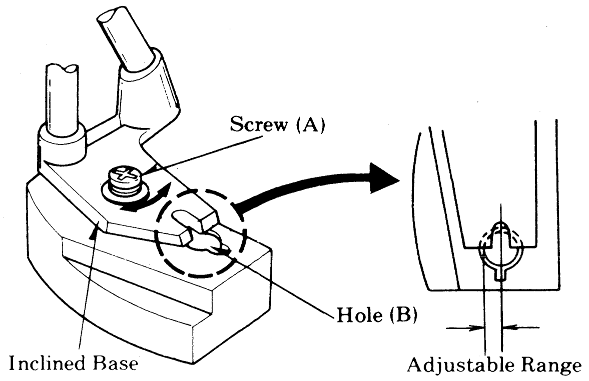

Screw (A)
Hole (B)
Inclined Base
Adjustable Range

Fig. M85

B-2. Post Height Adjustment

While playing back the monoscope portion of the alignment tape VFM8080H4, adjust posts P1, P2 and P3 by watchig the scope display (Test Point: TP6304 on the Test Point Board) so that the RF envelope on the scope becomes as flat as possible ($V1/V \geqq 0.7$, $V2/V \geqq 0.7$).

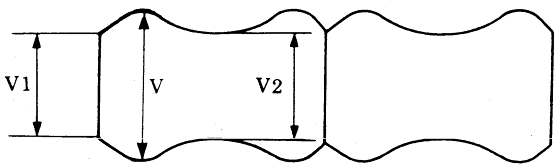
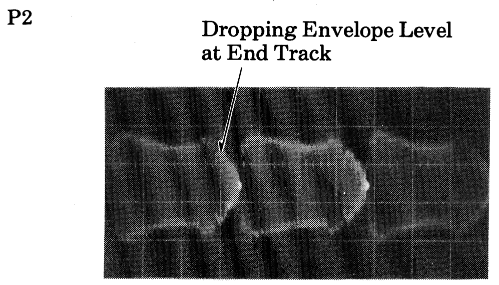


Fig. M86

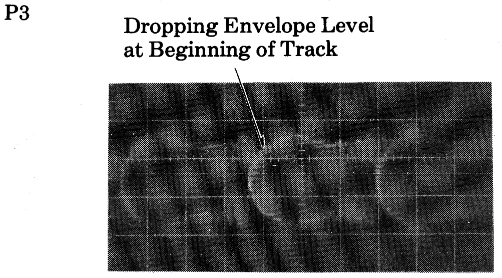
1. When the scope display is as follow, adjust the height of P-2 shown in the Fig. M79.


P2
Dropping Envelope Level at End Track

No Good

Fig. M87

2. When the scope display is as follow, adjust the height of P-3 shown in the Fig. M79.

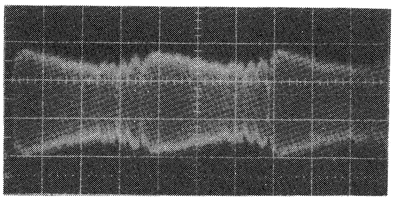

P3
Dropping Envelope Level at Beginning of Track

No Good

Fig. M88

3. The final scope display should become the condition as shown Fig. M89.

Envelope is adjusted properly



Good

Fig. M89

B-3. Head Amp. Out Put Adjustment

1. Set the unit with the condition of no connection of Video and Audio Inputs.
2. Make a recording of internal signal, and play back.
3. Connect the scope to Test Point of TP6304 on the Test Point Board.
4. Adjust the MIX volume (R391) on the Luminance Process Board, so that channel A and channel B outputs are equal.

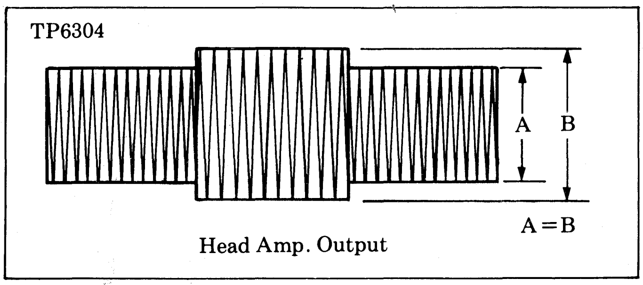


Fig. M 90

B-4. Audio/Control Head Position Adjustment

1. Be sure to set the Tracking Control on the Top Panel to the center position.
2. (A/C Head Height Adjustment)
   1. Connect the scope to the audio output on the Rear Panel.
   2. Play back the monoscope portion (6kHz, Audio) of the alignment tape VFM8080H4.
   3. Adjust the two screws (A) and the screw (B) shown in the Fig. M83 for maximum output.

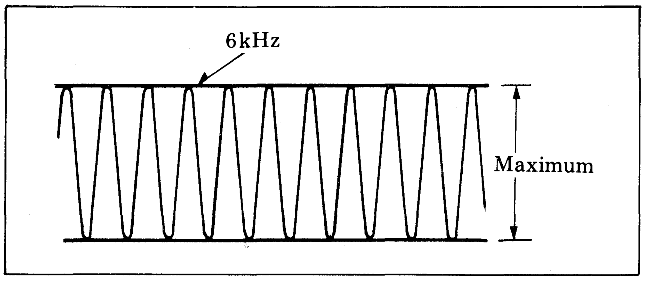


Fig. M91

3. (A/C Head Tilt Adjustment)
   While playing back the monoscope portion of the alignment tape VFM8080H4, adjust the hex screws (A) in Fig. M83 for the maximum RF envelope on the scope.

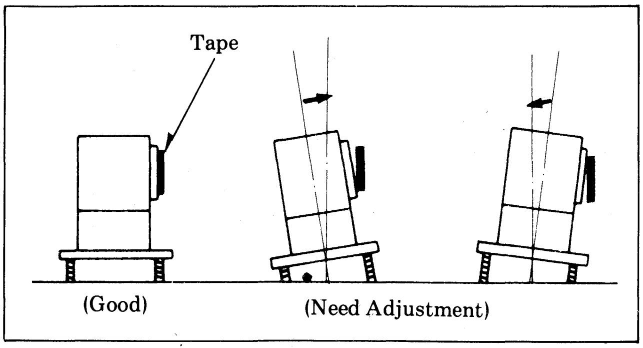


Fig. 92

4. (A/C Head Horizontal Position Adjustment)
   While playing back the monoscope portion of the alignment tape VFM8080H4, loosen the two screws (A) and move the A/C Head horizontally for the maximum RF envelope on the scope.

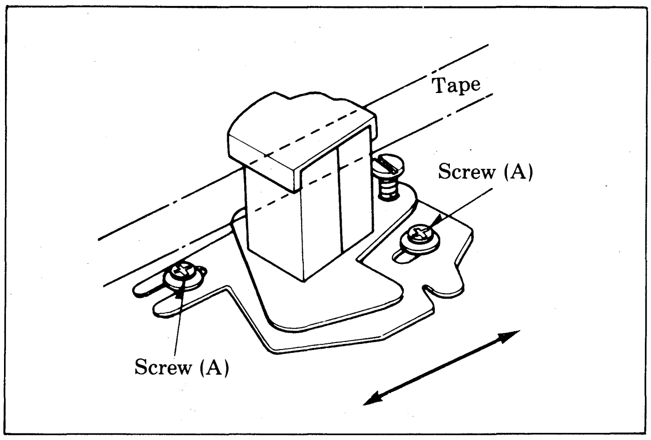
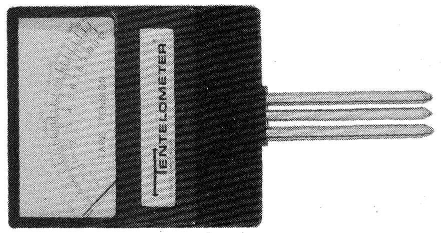


Fig. 93

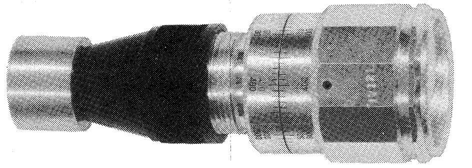
Servicing Jigs & Tools

VFM8080H4 VHS Alignment Tape

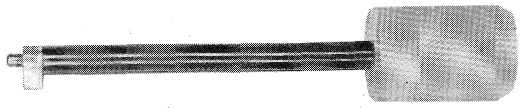
Back Tension Meter
(Tentelometer, Made in U.S.A.)



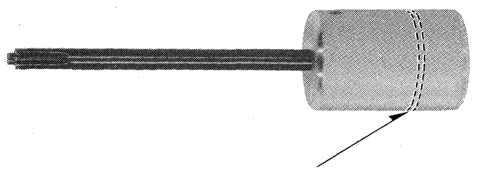
VFK0133 Dial Torque Gauge
VFK0134 Adaptor for VFK0133



VFK0135 Eccentric Screwdriver

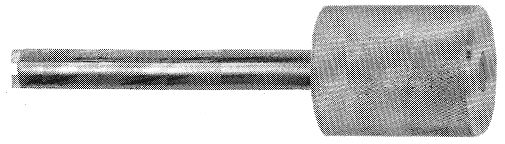


VFK0136 Fine Adjustment Screwdriver (3mmø)
VFK0157 Fine Adjustment Screwdriver (2.2mmø)

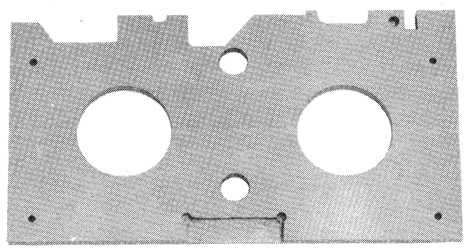


A stripe engraved for VFK0157

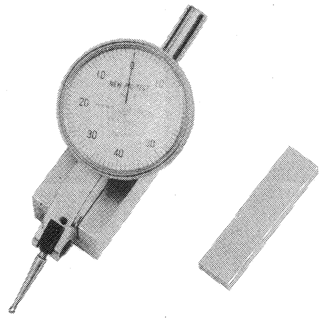
VFK0137 Post Adjustment Screwdriver



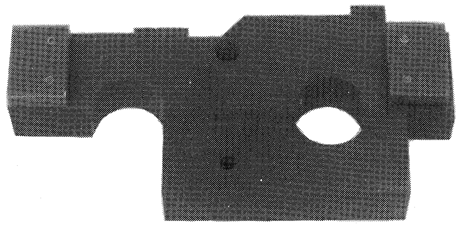
VFK0138 Post Adjustment Plate



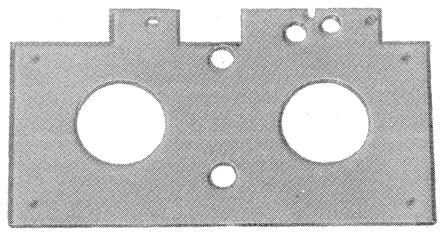
VFK0139 Reel Table Height Jig



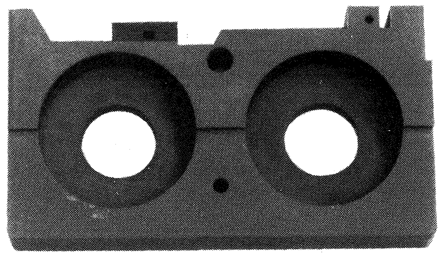
VFK0140 Cassette Lock Arm Adjustment Jig



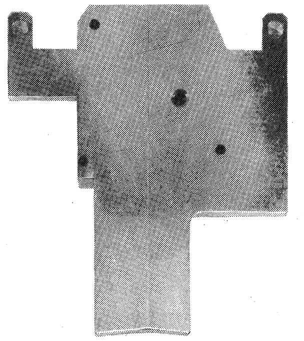
VFK0141 Capstan Reference Plate



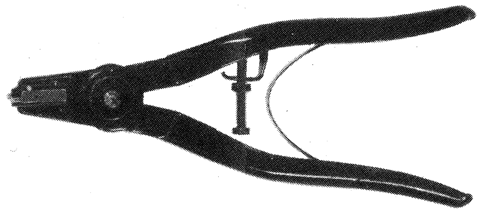
VFK0142 Cassette Holder Jig



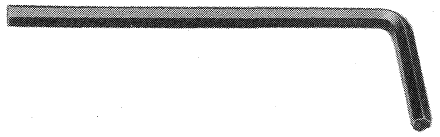
VFK0143 V-Stopper Adjustment Jig



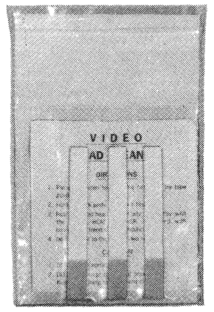
VFK0144 Retaining Ring Remover (3mmø)
VFK0145 Retaining Ring Remover (4mmø)



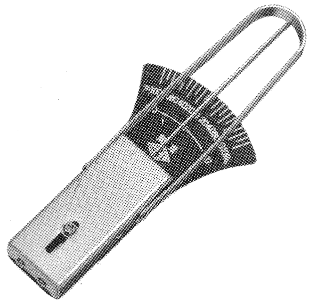
VFK0146 Hex. Wrench (0.9mm)
VFK75 Hex. Wrench (1.25mm)
VFK76 Hex. Wrench (1.5mm)



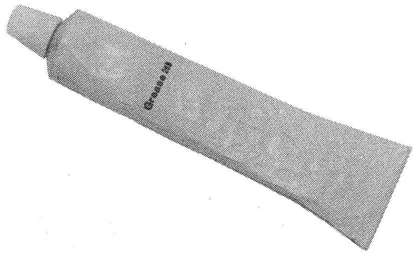
VFK27 Head Cleaning Stick



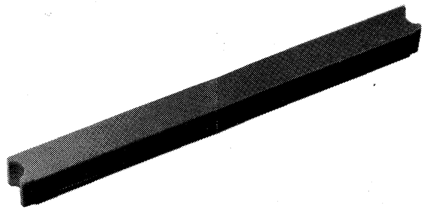
VFK66 Fan-type Tension Gauge



MOR265 Morlytone Grease



VFK0148 Cassette Tape Holder



ORDER NO. VRD-7810-303

Service Manual

Video Cassette Recorder

Panasonic VHS™

Omnivision IV

PV-1100

Vol. 3

Block Diagrams
Schematic Diagrams

SPECIFICATIONS

Power Source: 120VAC±10%, 60Hz±0.5%

Power Consumption: Approx. 29 watts

Television System: EIA Standard (525 lines, 60 fields)
NTSC color signal

Video Recording
System: 2 rotary heads helical scanning system
Luminance: FM azimuth recording
Chrominance: Converted subcarrier phase shift recording

Audio Track: 1 track

Tape Format: Tape width 1/2″ (12.7mm), high density tape

Tape Speed: SP mode: 1-5/16 i.p.s (33.35mm/s)
LP mode: 21/32 i.p.s (16.67mm/s)

Record/Playback Time: 1 or 2 hours with NV-T60
2 or 4 hours with NV-T120

FF/REW Time: Less than 4.5 min with NV-T120

Heads: Video: 2 rotary heads
Audio/Control: 1 stationary head
Erase: 1 full track
1 audio track erase for audio dubbing

Input Level: Video: Video IN Connector (RCA type)
1.0Vp-p, 75Ω unbalanced
Audio: MIC Jack (1/4″ PHONO JACK)
−70dB, 600Ω unbalanced
Audio IN Jack (RCA type)
−20dB, 100kΩ unbalanced
TV Tuners: VHF Input: VHF Ch2-Ch13,
65—90dBμ, 75Ω unbalanced
UHF Input: UHF Ch14-Ch83,
65—90dBμ, 300Ω balanced

Output Level: Video: Video OUT Connector (RCA type)
1.0Vp-p, 75Ω unbalanced
Audio: Audio OUT Jack (RCA type)
−6dB, 600Ω unbalanced
RF Modulated: Ch3/Ch4 switchable,
72dBμ, 75Ω unbalanced

Video Horizontal
Resolution: Color: more than 230 lines
B/W: more than 270 lines

Signal-to-Noise Ratio: Video: SP mode: better than 40dB
LP mode: better than 40dB
(Rohde & Schwarz noise meter)
Audio: SP mode: better than 42dB
LP mode: better than 40dB

Operation
Temperature: 41°F—104°F (5°C—40°C)

Operating Humidity: 10%—75%

Weight: 35.3/4lbs (16.3kg)

Dimensions: 19-1/8″(W)×15-1/2(D)×6-7/8(H)
(485mm×394mm×175mm)

Accessories Supplied:
- Blank tape
- Remote control unit
- 75Ω—300Ω matching transformer
- 300Ω—75Ω matching transformer
- Coaxial cable (5ft)
- F type connectors
- Twin lead wire (5ft)
- Dust cover
- Terminal Block

Available Tapes: 1/2″ VHS video cassette tapes
NV-T120 Approx. 810ft. (247m), 2 or 4 hrs.
NV-T60 Approx. 417ft. (127m), 1 or 2 hrs.

Weight and dimensions shown are approximate. Specifications are subject to change without notice.

Panasonic®

Panasonic Company
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Corporation of America
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New Jersey 07094

Panasonic Hawaii, Inc.
320 Waiakamilo Road, Honolulu,
Hawaii 96817

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40 Ronson Drive, Rexdale,
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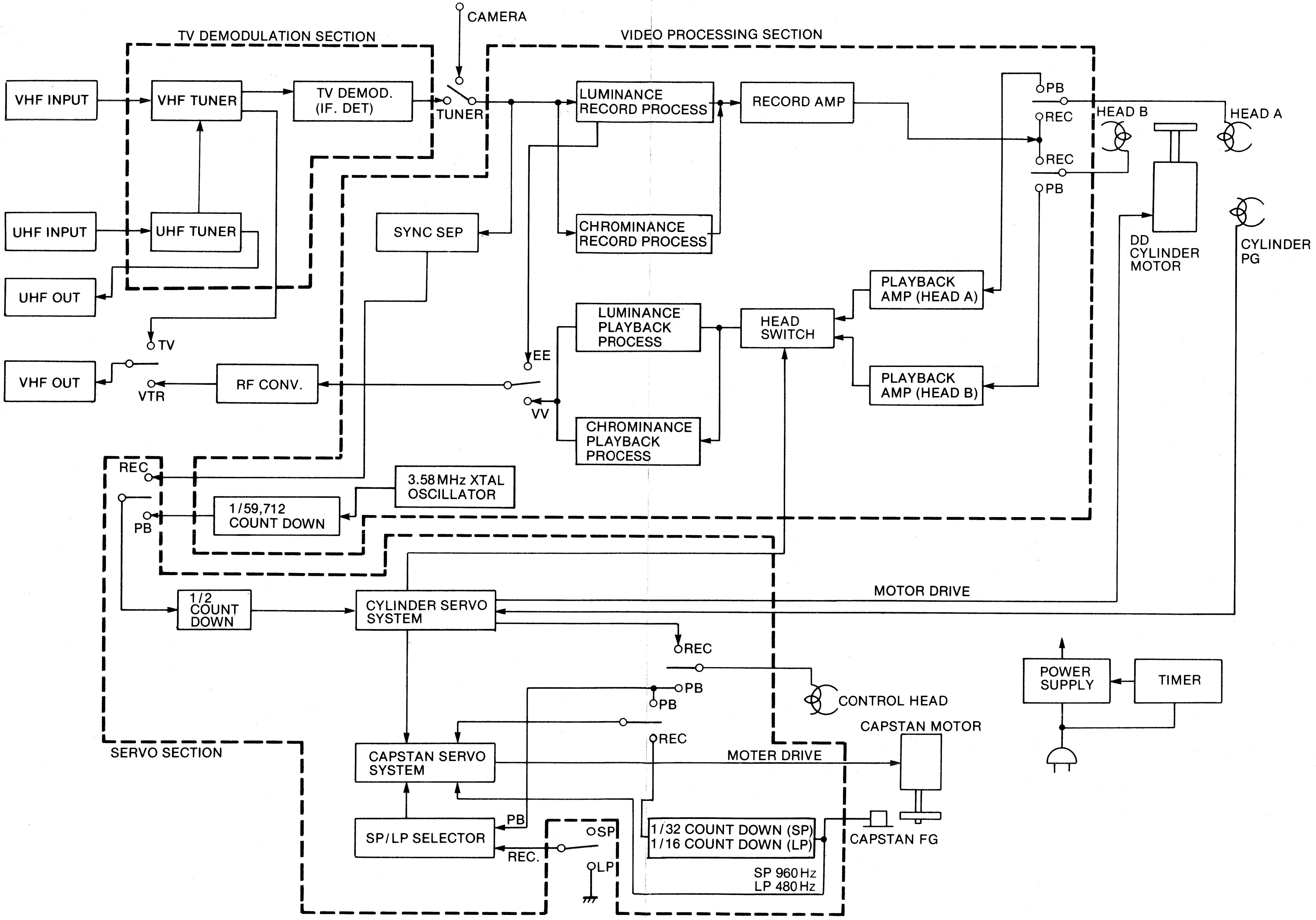
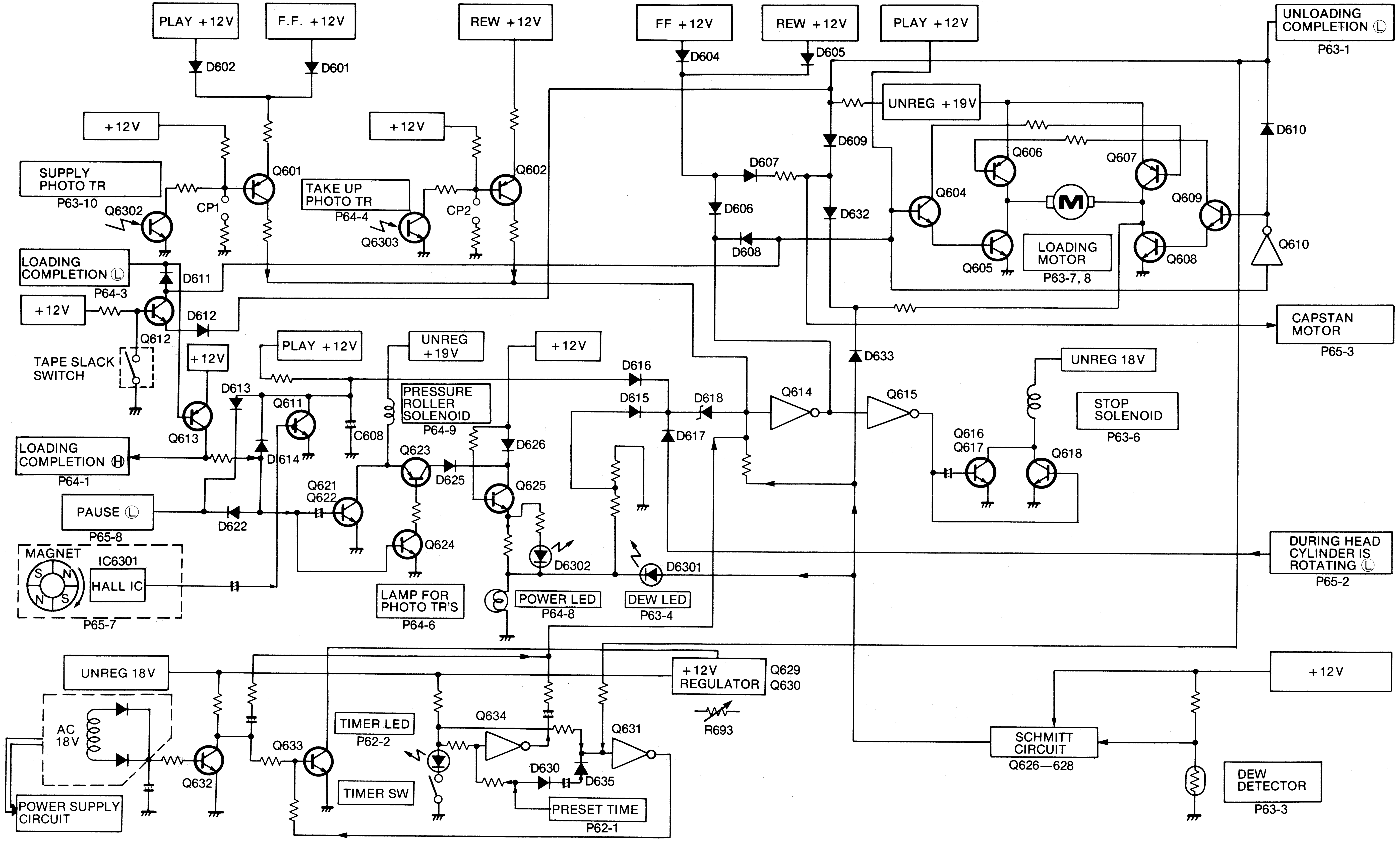
OVERALL BLOCK DIAGRAM

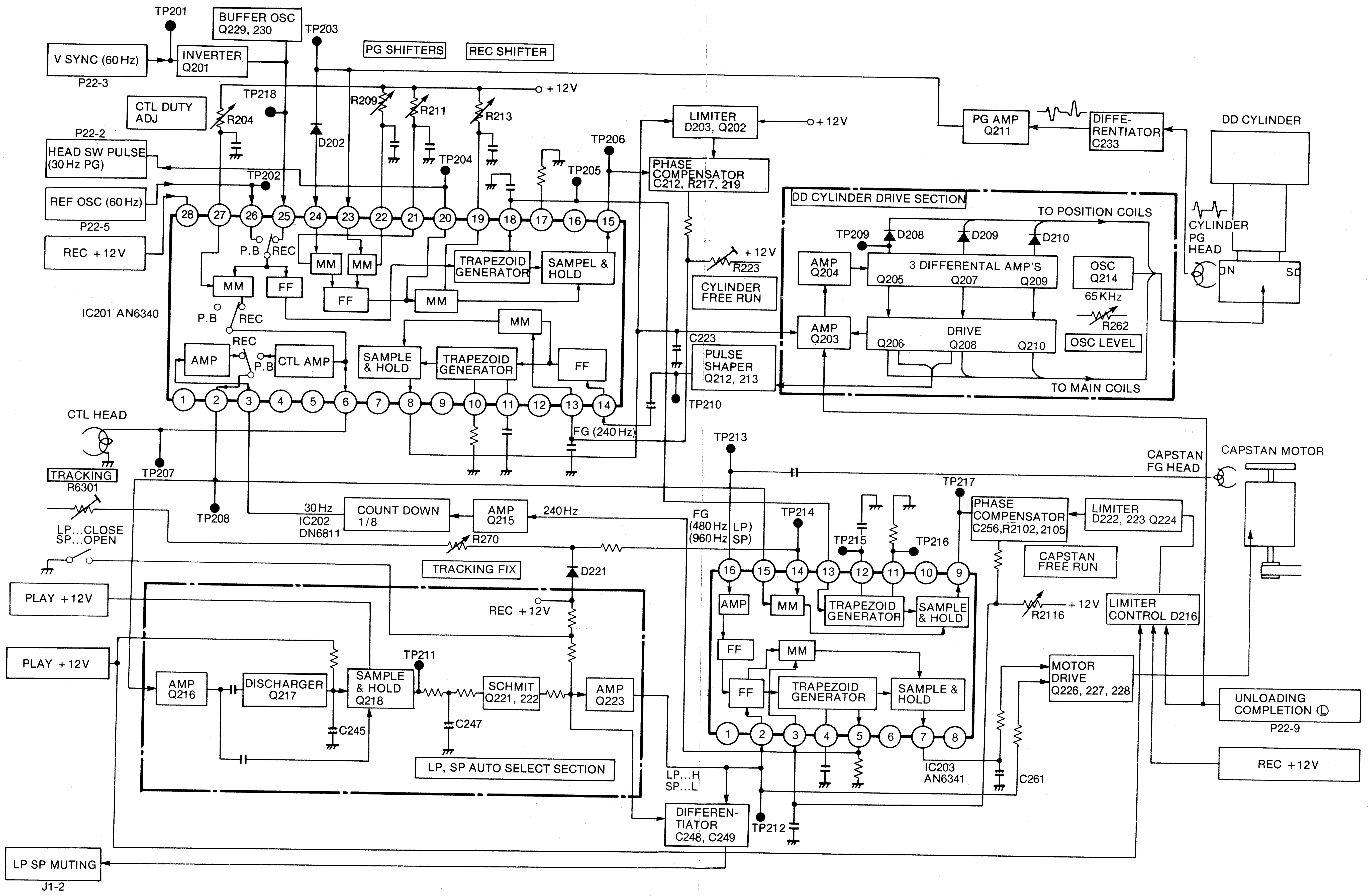

CAMERA
TV DEMODULATION SECTION
VIDEO PROCESSING SECTION
VHF INPUT
VHF TUNER
TV DEMOD. (IF. DET)
TUNER
LUMINANCE RECORD PROCESS
RECORD AMP
PB
REC
REC
PB
HEAD B
HEAD A
UHF INPUT
UHF TUNER
SYNC SEP
CHROMINANCE RECORD PROCESS
DD CYLINDER MOTOR
CYLINDER PG
UHF OUT
PLAYBACK AMP (HEAD A)
TV
LUMINANCE PLAYBACK PROCESS
HEAD SWITCH
EE
VHF OUT
VTR
RF CONV.
VV
PLAYBACK AMP (HEAD B)
CHROMINANCE PLAYBACK PROCESS
REC
3.58 MHz XTAL OSCILLATOR
PB
1/59,712 COUNT DOWN
MOTOR DRIVE
1/2 COUNT DOWN
CYLINDER SERVO SYSTEM
REC
PB
PB
CONTROL HEAD
POWER SUPPLY
TIMER
REC
SERVO SECTION
CAPSTAN MOTOR
MOTER DRIVE
CAPSTAN SERVO SYSTEM
PB
SP/LP SELECTOR
SP
REC.
LP
1/32 COUNT DOWN (SP)
1/16 COUNT DOWN (LP)
CAPSTAN FG
SP 960 Hz
LP 480 Hz

TRANSPORT BLOCK DIAGRAM



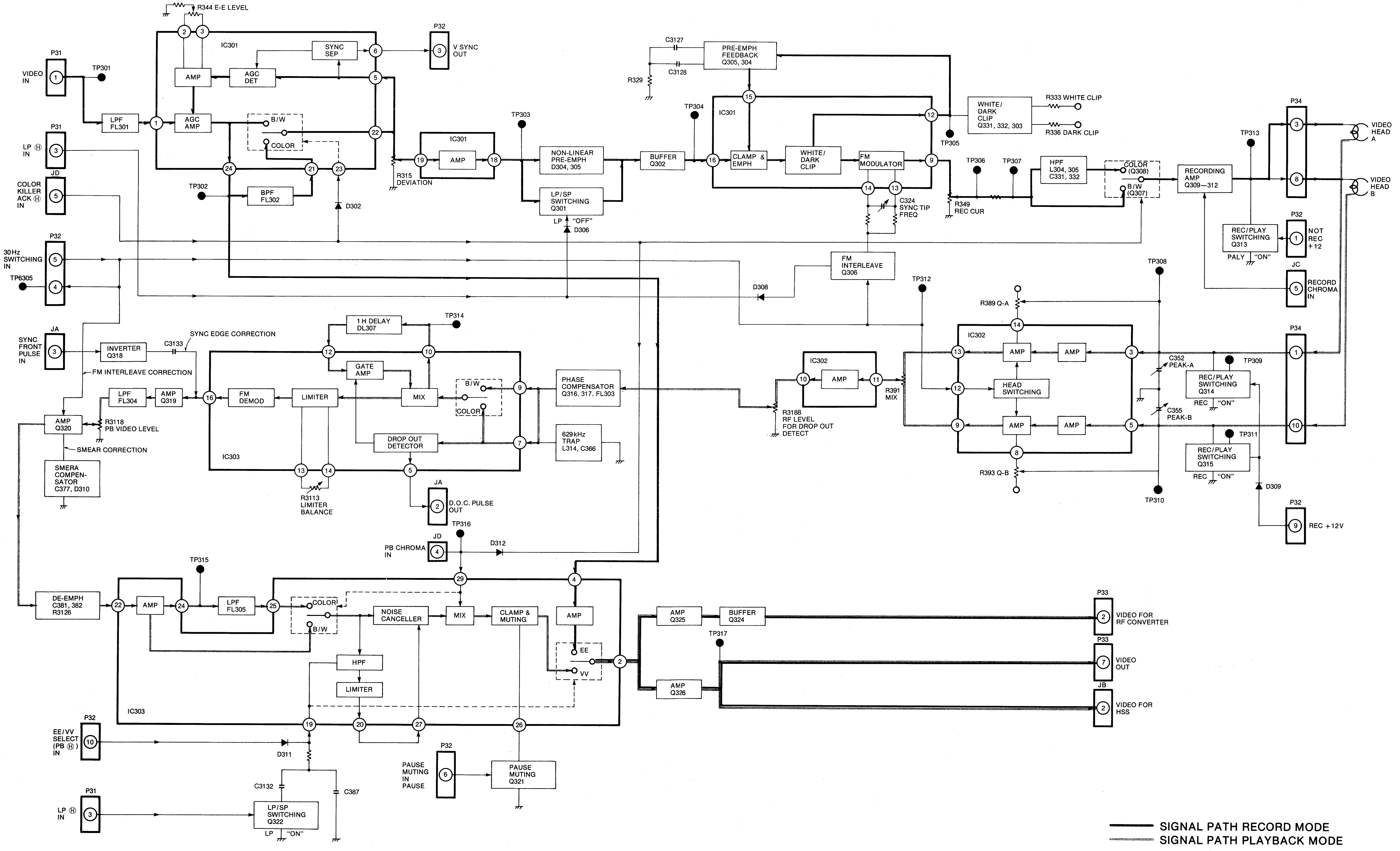
PLAY +12V
F.F. +12V
REW +12V
FF +12V
REW +12V
PLAY +12V
UNLOADING COMPLETION Ⓛ
P63-1
D602
D601
D604
D605
+12V
+12V
UNREG +19V
D610
D609
SUPPLY PHOTO TR
P63-10
Q601
TAKE UP PHOTO TR
P64-4
Q602
Q6302
CP1
Q6303
CP2
D607
Q606
Q607
D606
D632
Q604
Q609
Q610
D608
Q605
LOADING MOTOR
P63-7, 8
Q608
LOADING COMPLETION Ⓛ
P64-3
D611
+12V
D612
Q612
CAPSTAN MOTOR
P65-3
TAPE SLACK SWITCH
+12V
PLAY +12V
UNREG +19V
+12V
D633
UNREG 18V
D616
D613
Q611
PRESSURE ROLLER SOLENOID
P64-9
D615
D618
Q614
Q615
STOP SOLENOID
P63-6
Q613
C608
D617
Q616
Q617
Q618
LOADING COMPLETION Ⓗ
P64-1
D614
Q623
D626
D625
Q621
Q622
Q625
PAUSE Ⓛ
P65-8
D622
Q624
DURING HEAD CYLINDER IS ROTATING Ⓛ
P65-2
MAGNET
IC6301
S
N
N
S
HALL IC
P65-7
D6302
D6301
LAMP FOR PHOTO TR'S
P64-6
POWER LED
P64-8
DEW LED
P63-4
UNREG 18V
+12V REGULATOR
Q629
Q630
+12V
R693
AC 18V
Q634
Q631
TIMER LED
P62-2
Q633
SCHMITT CIRCUIT
Q626—628
Q632
D630
D635
DEW DETECTOR
P63-3
TIMER SW
PRESET TIME
P62-1
POWER SUPPLY CIRCUIT

SERVO BLOCK DIAGRAM

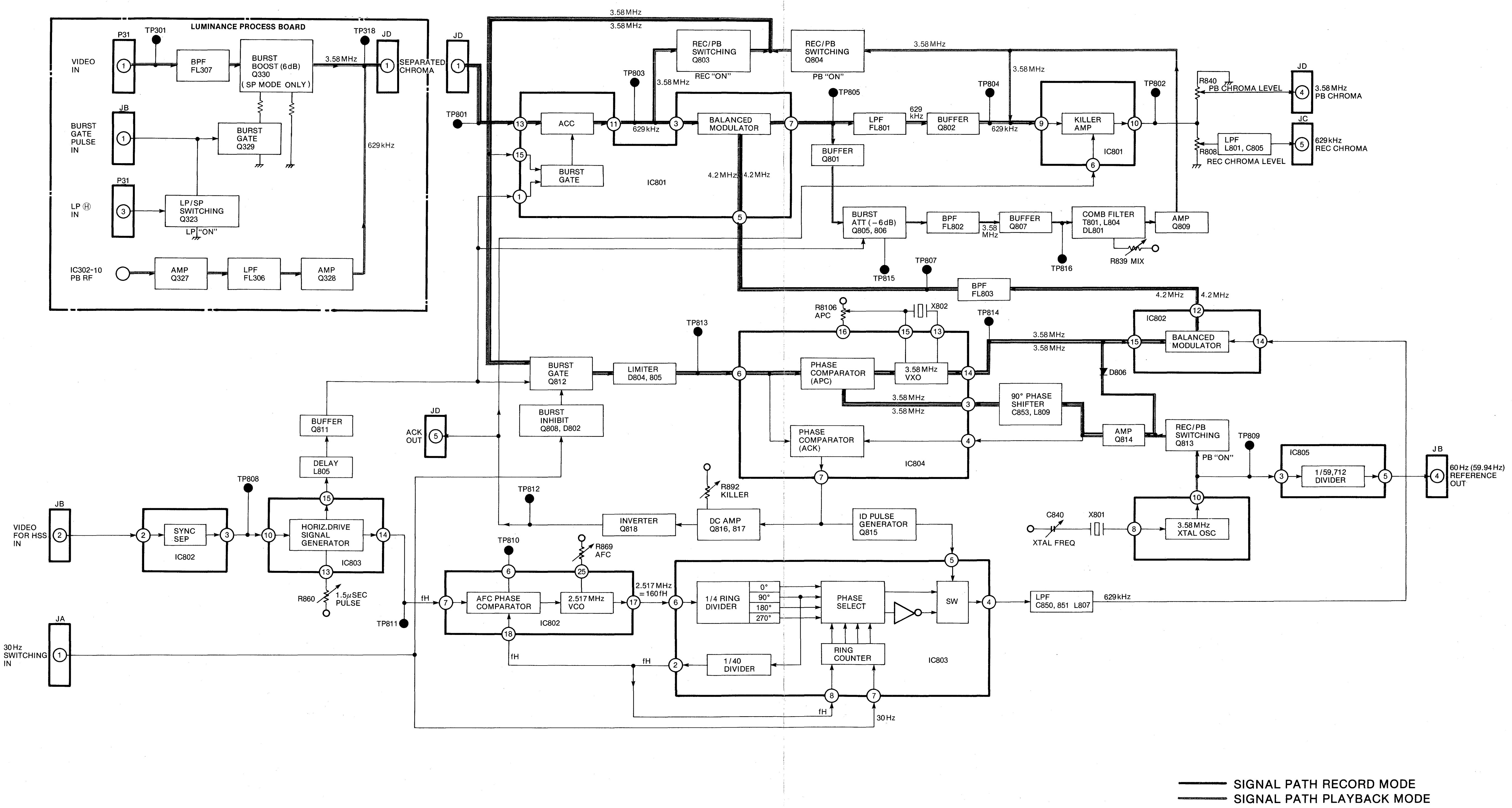


TP201
BUFFER OSC Q229, 230
TP203
PG SHIFTERS
REC SHIFTER
V SYNC (60 Hz)
P22-3
INVERTER Q201
+12V
CTL DUTY ADJ
TP218
R204
R209
R211
R213
D202
TP204
P22-2
HEAD SW PULSE (30 Hz PG)
TP202
REF OSC (60 Hz)
P22-5
REC +12V
LIMITER D203, Q202
+12V
TP206
TP205
PHASE COMPENSATOR C212, R217, 219
PG AMP Q211
DIFFE-RENTIATOR C233
DD CYLINDER
CYLINDER PG HEAD
N
S
28
27
26
25
24
23
22
21
20
19
18
17
16
15
P.B
REC
MM
MM
MM
FF
FF
MM
TRAPEZOID GENERATOR
SAMPEL & HOLD
P.B
REC
IC201 AN6340
MM
REC
AMP
P.B
CTL AMP
SAMPLE & HOLD
TRAPEZOID GENERATOR
FF
1
2
3
4
5
6
7
8
9
10
11
12
13
14
FG (240 Hz)
+12V
R223
CYLINDER FREE RUN
C223
PULSE SHAPER Q212, 213
TP210
DD CYLINDER DRIVE SECTION
TO POSITION COILS
TP209
D208
D209
D210
AMP Q204
3 DIFFERENTAL AMP'S
Q205
Q207
Q209
OSC Q214
65 KHz
R262
OSC LEVEL
AMP Q203
DRIVE
Q206
Q208
Q210
TO MAIN COILS
CTL HEAD
TRACKING R6301
TP207
TP208
TP213
CAPSTAN FG HEAD
CAPSTAN MOTOR
TP217
30 Hz IC202 DN6811
COUNT DOWN 1/8
AMP Q215
240 Hz
FG (480 Hz LP) (960 Hz SP)
TP214
LP...CLOSE SP...OPEN
R270
TP215
TP216
PHASE COMPENSATOR C256, R2102, 2105
LIMITER D222, 223 Q224
CAPSTAN FREE RUN
TRACKING FIX
D221
16
15
14
13
12
11
10
9
PLAY +12V
REC +12V
AMP
MM
TRAPEZOID GENERATOR
SAMPLE & HOLD
+12V
R2116
LIMITER CONTROL D216
FF
MM
PLAY +12V
TP211
AMP Q216
DISCHARGER Q217
SAMPLE & HOLD Q218
SCHMIT Q221, 222
AMP Q223
FF
TRAPEZOID GENERATOR
SAMPLE & HOLD
MOTOR DRIVE Q226, 227, 228
UNLOADING COMPLETION Ⓛ
P22-9
C245
C247
1
2
3
4
5
6
7
8
LP, SP AUTO SELECT SECTION
LP...H SP...L
IC203 AN6341
C261
REC +12V
DIFFEREN-TIATOR C248, C249
TP212
LP SP MUTING
J1-2

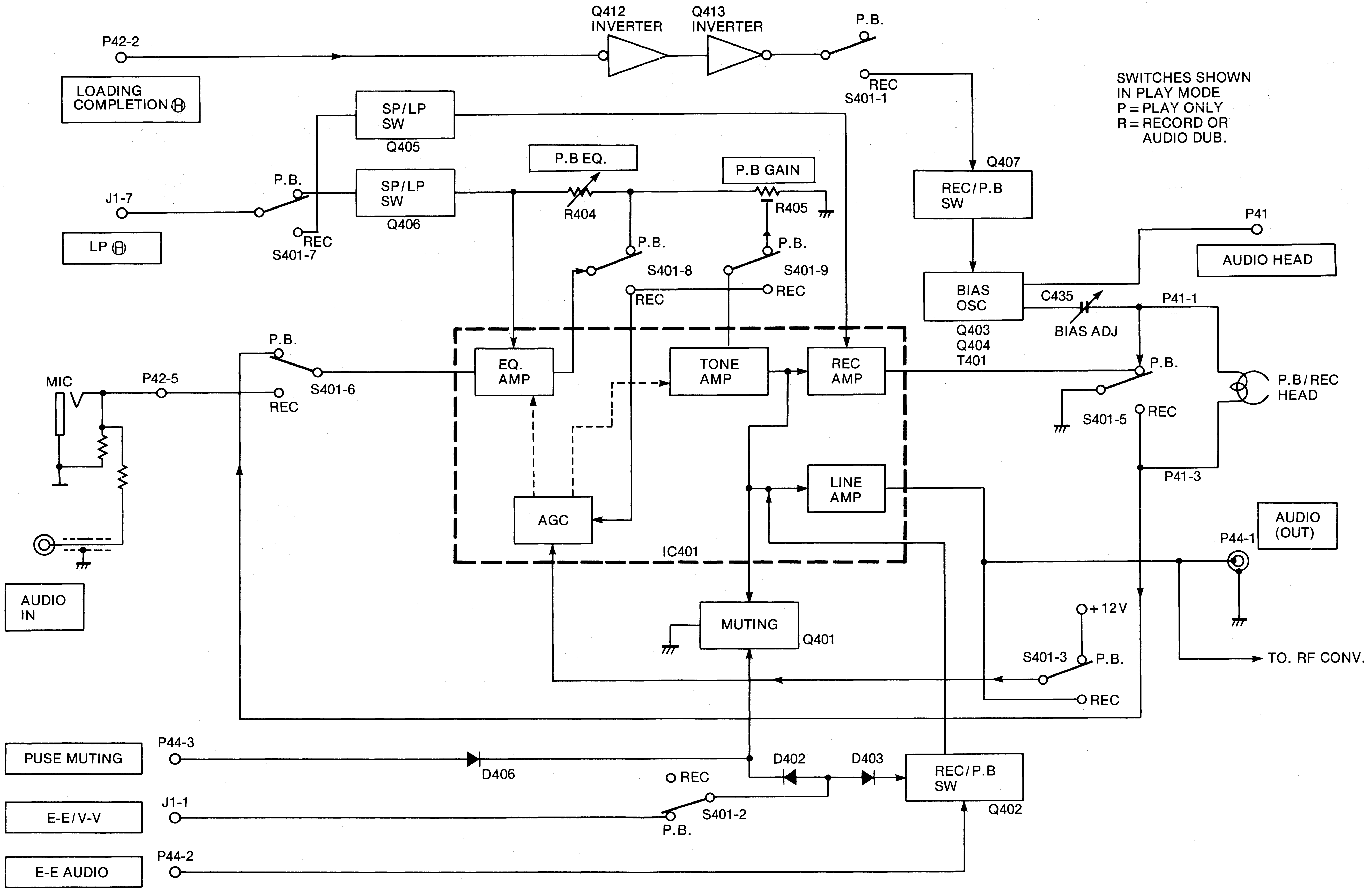
LUMINANCE PROCESS BLOCK DIAGRAM


R344 E-E LEVEL
IC301
SYNC SEP
P32
V SYNC OUT
P31
VIDEO IN
TP301
AMP
AGC DET
LPF FL301
AGC AMP
B/W
COLOR
LP Ⓗ IN
JD
COLOR KILLER ACK Ⓗ IN
TP302
BPF FL302
D302
P32
30Hz SWITCHING IN
TP6305
TP303
IC301
AMP
R315 DEVIATION
NON-LINEAR PRE-EMPH D304, 305
LP/SP SWITCHING Q301
LP "OFF"
D306
C3127
C3128
R329
PRE-EMPH FEEDBACK Q305, 304
TP304
BUFFER Q302
IC301
CLAMP & EMPH
WHITE/ DARK CLIP
FM MODULATOR
TP305
WHITE/ DARK CLIP Q331, 332, 303
R333 WHITE CLIP
R336 DARK CLIP
C324 SYNC TIP FREQ
R349 REC CUR
TP306
TP307
HPF L304, 305 C331, 332
COLOR (Q308)
B/W (Q307)
RECORDING AMP Q309—312
TP313
P34
VIDEO HEAD A
VIDEO HEAD B
REC/PLAY SWITCHING Q313
PALY "ON"
P32
NOT REC +12
JC
RECORD CHROMA IN
FM INTERLEAVE Q306
D308
TP312
TP308
JA
SYNC FRONT PULSE IN
INVERTER Q318
C3133
SYNC EDGE CORRECTION
FM INTERLEAVE CORRECTION
1 H DELAY DL307
TP314
GATE AMP
LPF FL304
AMP Q319
FM DEMOD
LIMITER
MIX
B/W
COLOR
DROP OUT DETECTOR
IC303
PHASE COMPENSATOR Q316, 317, FL303
629kHz TRAP L314, C366
AMP Q320
R3118 PB VIDEO LEVEL
SMEAR CORRECTION
SMERA COMPEN- SATOR C377, D310
R3113 LIMITER BALANCE
JA
D.O.C. PULSE OUT
IC302
AMP
R3188 RF LEVEL FOR DROP OUT DETECT
R391 MIX
R389 Q-A
IC302
AMP
AMP
HEAD SWITCHING
AMP
AMP
R393 Q-B
C352 PEAK-A
C355 PEAK-B
TP309
REC/PLAY SWITCHING Q314
REC "ON"
TP311
REC/PLAY SWITCHING Q315
REC "ON"
D309
TP310
P34
P32
REC +12V
TP316
JD
PB CHROMA IN
D312
TP315
DE-EMPH C381, 382 R3126
AMP
LPF FL305
COLOR
B/W
NOISE CANCELLER
MIX
CLAMP & MUTING
AMP
EE
VV
HPF
LIMITER
IC303
AMP Q325
BUFFER Q324
TP317
AMP Q326
P33
VIDEO FOR RF CONVERTER
P33
VIDEO OUT
JB
VIDEO FOR HSS
P32
EE/VV SELECT (PB Ⓗ) IN
D311
C3132
C387
P31
LP Ⓗ IN
LP/SP SWITCHING Q322
LP "ON"
P32
PAUSE MUTING IN PAUSE
PAUSE MUTING Q321
SIGNAL PATH RECORD MODE
SIGNAL PATH PLAYBACK MODE

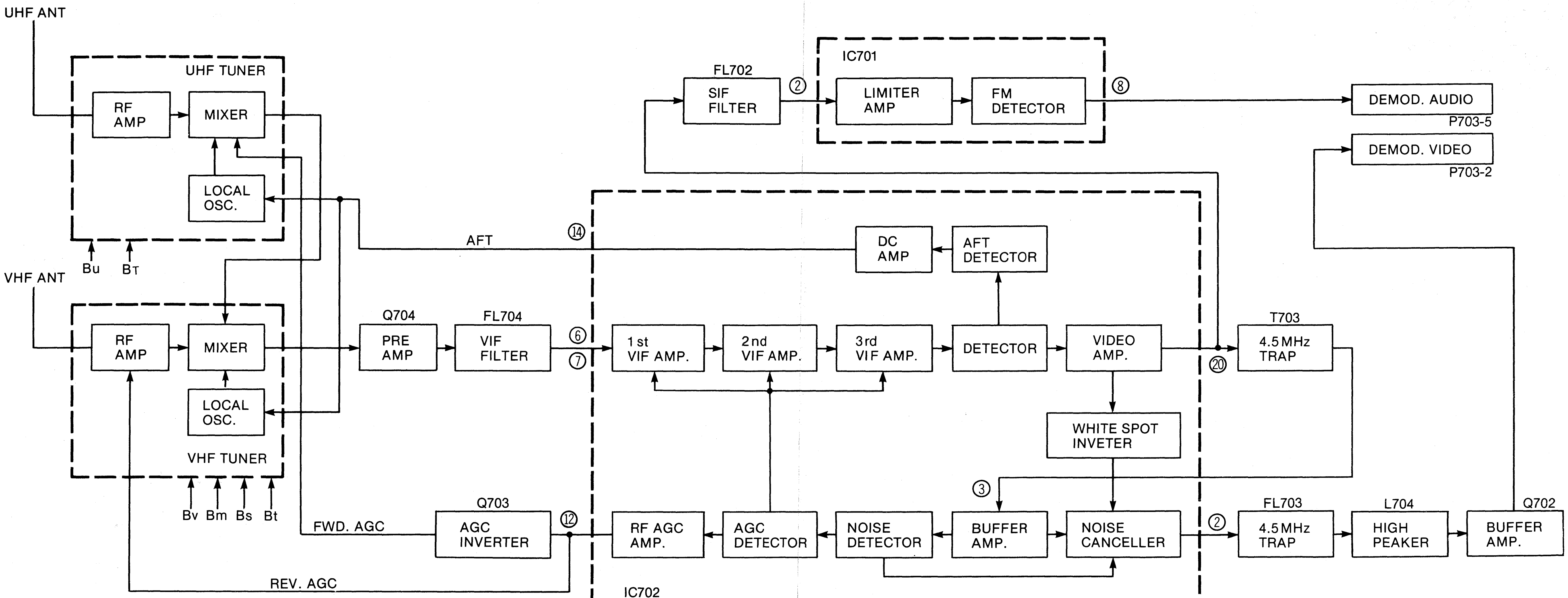
CHROMINANCE PROCESS BLOCK DIAGRAM


LUMINANCE PROCESS BOARD
P31
TP301
TP318
JD
VIDEO IN
BPF FL307
BURST BOOST (6dB) Q330 (SP MODE ONLY)
3.58MHz
SEPARATED CHROMA
JB
BURST GATE PULSE IN
BURST GATE Q329
629kHz
P31
LP Ⓗ IN
LP/SP SWITCHING Q323
LP "ON"
IC302-10 PB RF
AMP Q327
LPF FL306
AMP Q328
JD
TP801
3.58MHz
3.58MHz
REC/PB SWITCHING Q803
REC "ON"
REC/PB SWITCHING Q804
PB "ON"
TP803
3.58MHz
ACC
629kHz
BALANCED MODULATOR
BURST GATE
IC801
4.2MHz
4.2MHz
TP805
LPF FL801
629 kHz
BUFFER Q802
629kHz
BUFFER Q801
TP804
3.58MHz
KILLER AMP
IC801
TP802
R840
PB CHROMA LEVEL
JD
3.58MHz PB CHROMA
JC
LPF L801, C805
R808
REC CHROMA LEVEL
629kHz REC CHROMA
BURST ATT (−6dB) Q805, 806
BPF FL802
3.58 MHz
BUFFER Q807
COMB FILTER T801, L804 DL801
AMP Q809
R839 MIX
TP816
TP815
TP807
BPF FL803
4.2MHz
4.2MHz
R8106 APC
X802
TP814
TP813
IC802
BALANCED MODULATOR
3.58MHz
3.58MHz
BURST GATE Q812
LIMITER D804, 805
PHASE COMPARATOR (APC)
3.58MHz VXO
D806
3.58MHz
3.58MHz
90° PHASE SHIFTER C853, L809
PHASE COMPARATOR (ACK)
IC804
AMP Q814
REC/PB SWITCHING Q813
PB "ON"
TP809
IC805
1/59,712 DIVIDER
JB
60Hz (59.94Hz) REFERENCE OUT
BURST INHIBIT Q808, D802
JD
ACK OUT
BUFFER Q811
DELAY L805
TP808
JB
VIDEO FOR HSS IN
SYNC SEP
IC802
HORIZ.DRIVE SIGNAL GENERATOR
IC803
R860
1.5μSEC PULSE
TP812
R892 KILLER
INVERTER Q818
DC AMP Q816, 817
ID PULSE GENERATOR Q815
C840
X801
XTAL FREQ
3.58MHz XTAL OSC
TP810
R869 AFC
fH
AFC PHASE COMPARATOR
2.517MHz VCO
IC802
2.517MHz =160fH
TP811
1/4 RING DIVIDER
0°
90°
180°
270°
PHASE SELECT
SW
LPF C850, 851 L807
629kHz
RING COUNTER
IC803
1/40 DIVIDER
fH
fH
fH
30Hz
JA
30Hz SWITCHING IN
SIGNAL PATH RECORD MODE
SIGNAL PATH PLAYBACK MODE

AUDIO CIRCUIT BLOCK DIAGRAM

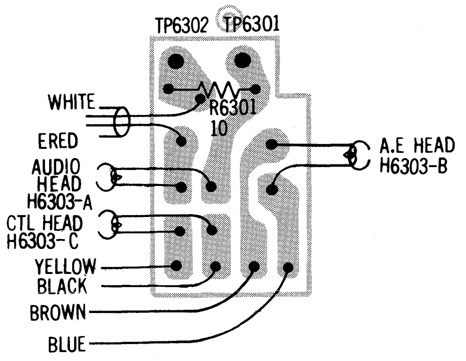

Q412
INVERTER
Q413
INVERTER
P.B.
P42-2
LOADING COMPLETION Ⓗ
REC
S401-1
SWITCHES SHOWN IN PLAY MODE
P = PLAY ONLY
R = RECORD OR AUDIO DUB.
SP/LP SW
Q405
P.B EQ.
P.B GAIN
Q407
P.B.
J1-7
SP/LP SW
Q406
R404
R405
REC/P.B SW
REC
S401-7
LP Ⓗ
P.B.
P.B.
P41
S401-8
S401-9
AUDIO HEAD
REC
REC
BIAS OSC
C435
P41-1
Q403
Q404
T401
BIAS ADJ
P.B.
EQ. AMP
TONE AMP
REC AMP
P.B.
MIC
P42-5
S401-6
REC
P.B/REC HEAD
S401-5
REC
P41-3
LINE AMP
AGC
IC401
AUDIO (OUT)
P44-1
AUDIO IN
MUTING
Q401
+12V
S401-3
P.B.
TO. RF CONV.
REC
P44-3
PUSE MUTING
D406
D402
D403
REC
REC/P.B SW
E-E/V-V
J1-1
S401-2
P.B.
Q402
E-E AUDIO
P44-2

TV DEMODULATOR BLOCK DIAGRAM

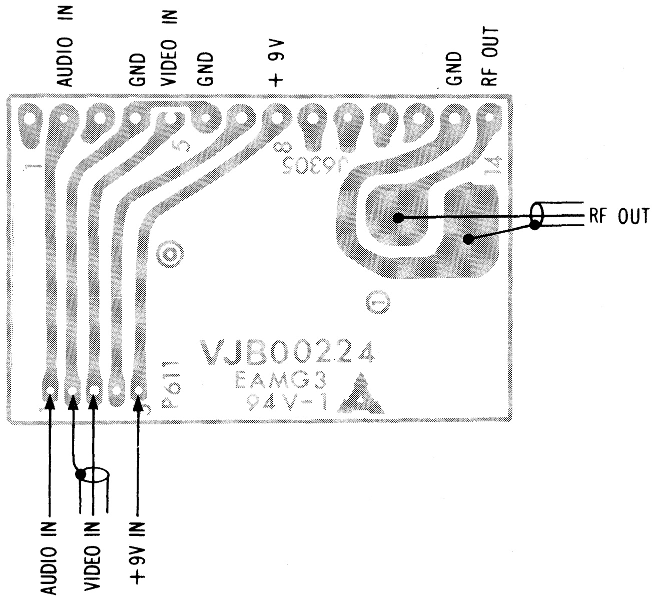


UHF ANT
UHF TUNER
RF AMP
MIXER
LOCAL OSC.
Bu
BT
VHF ANT
RF AMP
MIXER
LOCAL OSC.
VHF TUNER
Bv
Bm
Bs
Bt
AFT
⑭
Q704
PRE AMP
FL704
VIF FILTER
⑥
⑦
FWD. AGC
Q703
AGC INVERTER
⑫
REV. AGC
FL702
SIF FILTER
②
IC701
LIMITER AMP
FM DETECTOR
⑧
DEMOD. AUDIO
P703-5
DEMOD. VIDEO
P703-2
DC AMP
AFT DETECTOR
1st VIF AMP.
2nd VIF AMP.
3rd VIF AMP.
DETECTOR
VIDEO AMP.
WHITE SPOT INVETER
③
RF AGC AMP.
AGC DETECTOR
NOISE DETECTOR
BUFFER AMP.
NOISE CANCELLER
IC702
⑳
T703
4.5MHz TRAP
②
FL703
4.5MHz TRAP
L704
HIGH PEAKER
Q702
BUFFER AMP.

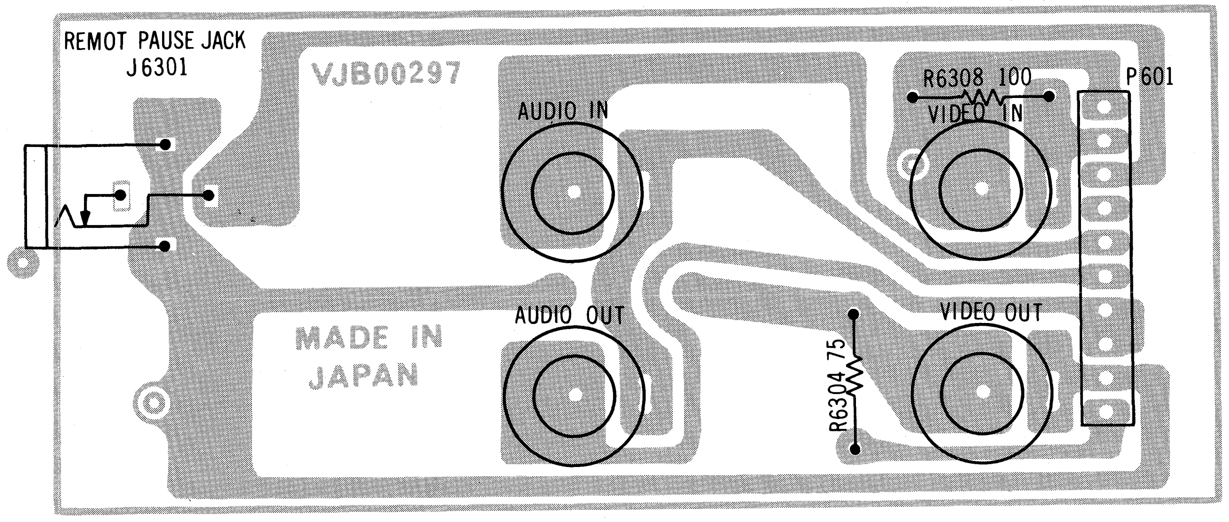
AUDIO HEAD CONNECTION C.B.A. (VEH0086)


TP6302
TP6301
WHITE
R6301
10
ERED
AUDIO HEAD H6303-A
CTL HEAD H6303-C
YELLOW
BLACK
BROWN
BLUE
A.E HEAD
H6303-B

RF CONVERTER CONNECTION C.B.A. (VEK0502)


AUDIO IN
GND
VIDEO IN
GND
+ 9V
GND
RF OUT
1
5
8
14
J6305
VJB00224
EAMG3
94V-1
P611
RF OUT
AUDIO IN
VIDEO IN
+9V IN

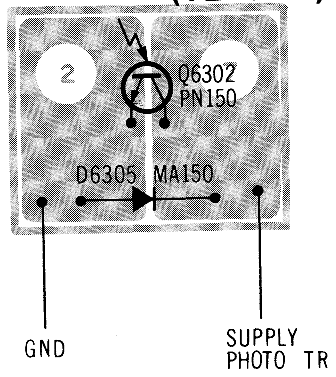
REAR JACK C.B.A. (VEJ0181)


REMOT PAUSE JACK
J6301
VJB00297
AUDIO IN
R6308 100
VIDEO IN
P601
AUDIO OUT
VIDEO OUT
MADE IN JAPAN
R6304 75

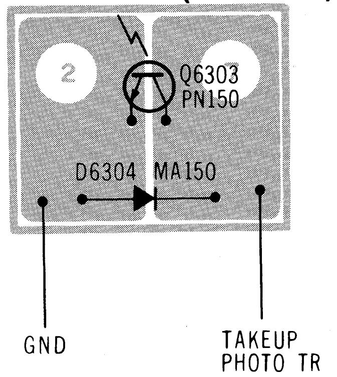
P601

1	LINE VIDEO(IN)
2	GND
3	REMOTE PAUSE
4	
5	LINE AUDIO(IN)
6	GND
7	AUDIO FOR RF
8	AUDIO(OUT)
9	GND
10	VIDEO(OUT)

SUPPLY PHOTO TR CONNECTION C.B.A. (VEK0509)


2
Q6302
PN150
D6305 MA150
GND
SUPPLY PHOTO TR

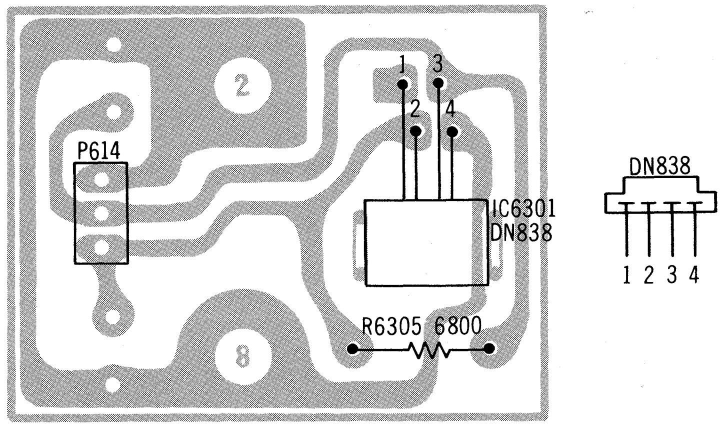
TAKEUP PHOTO TR CONNECTION C.B.A. (VEK0510)


2
Q6303
PN150
D6304 MA150
GND
TAKEUP PHOTO TR

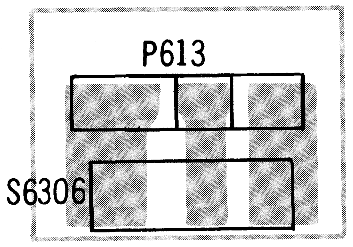
REEL SENSOR C.B.A. (VEK0503)

P614

1	GND
2	TAKEUP DETECTOR
3	+12V


2
1
3
2
4
P614
IC6301
DN838
R6305 6800
8
DN838
1 2 3 4

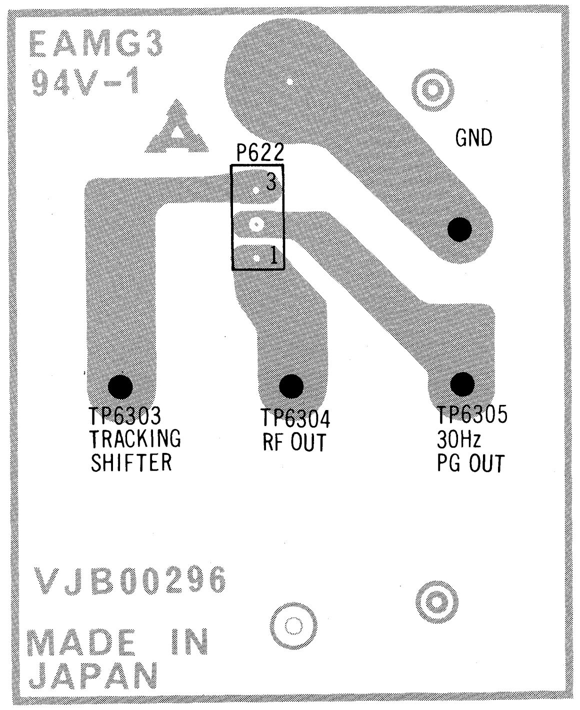
TAPE SLACK C.B.A. (VEK0504)



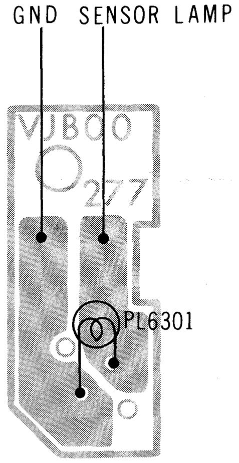
1	STOP SOLENOID
2	TAPE SLACK SW
3	STOP SOLENOID

RF ENVELOPE TP'S C.B.A. (VEK0513)

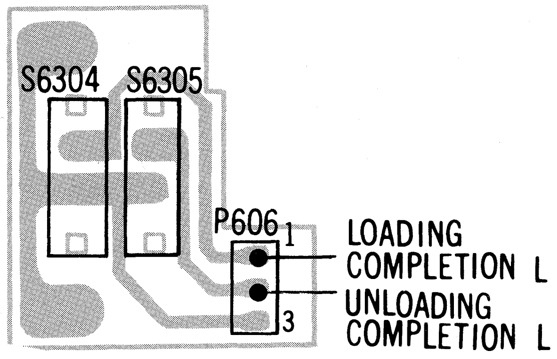
3	TRACKING (TP6303)
2	30Hz PG(TP6305)
1	RF(TP6304)


EAMG3
94V-1
GND
P622
3
1
TP6303
TRACKING
SHIFTER
TP6304
RF OUT
TP6305
30Hz
PG OUT
VJB00296
MADE IN JAPAN

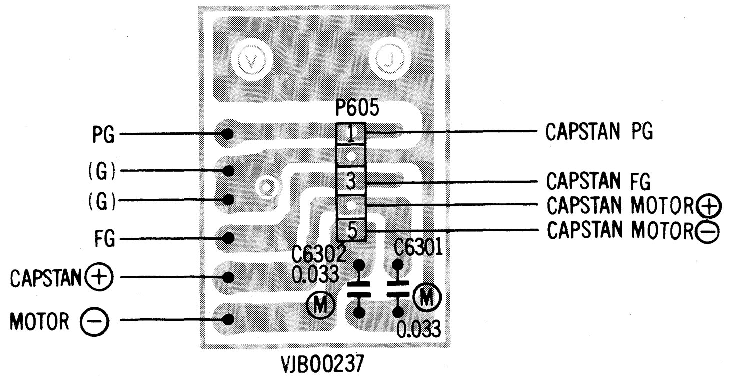
SENSOR LAMP C.B.A. (VEK0506)


GND
SENSOR LAMP
VJB00
277
PL6301

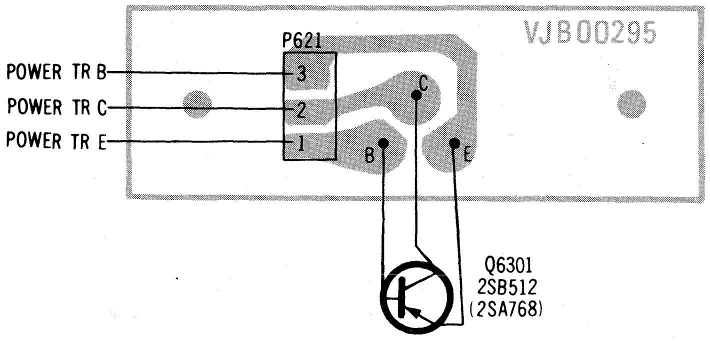
LOADING/UNLOADING COMPLETION SWITCHES C.B.A. (VEK0507)


S6304
S6305
P606
1
3
LOADING COMPLETION L
UNLOADING COMPLETION L

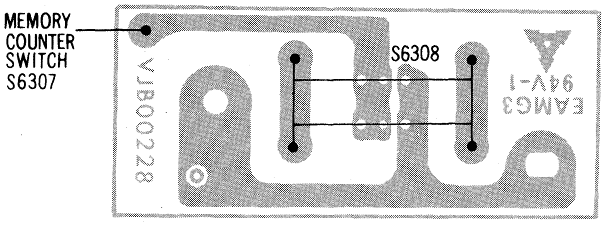
CAPSTAN MOTOR C.B.A. (VEK0511)


PG
(G)
(G)
FG
CAPSTAN⊕
MOTOR ⊖
P605
1
3
5
C6302
0.033
C6301
0.033
CAPSTAN PG
CAPSTAN FG
CAPSTAN MOTOR⊕
CAPSTAN MOTOR⊖
VJB00237

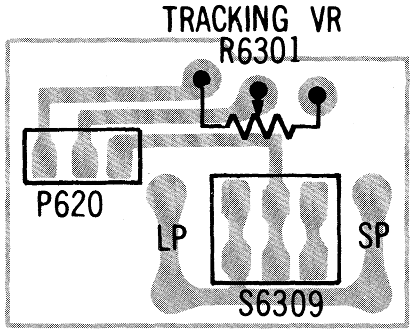
POWER TR C.B.A. (VEK0514)


VJB00295
P621
POWER TR B
POWER TR C
POWER TR E
3
2
1
C
B
E
Q6301
2SB512
(2SA768)

MEMORY SWITCH C.B.A. (VEP0228A)


MEMORY
COUNTER
SWITCH
S6307
VJB00228
S6308
EAMG3
94V-1

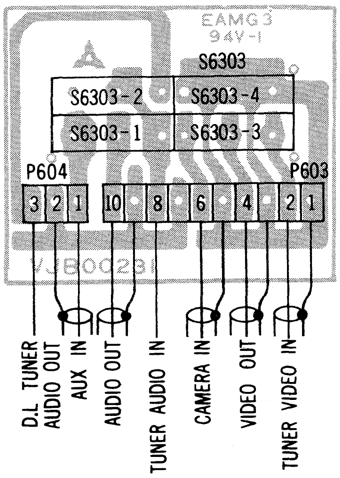
LP/SP SELECT SW C.B.A. (VES0100)


TRACKING VR
R6301
P620
LP
SP
S6309

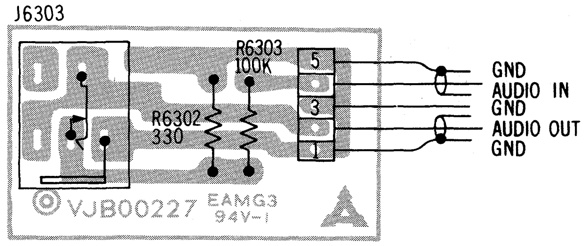
P620

1	LP/SP SW
2	TRACKING CONTROL
3	TRACKING CONTROL

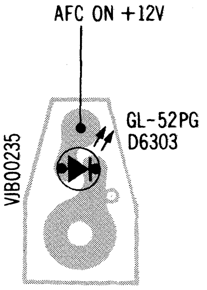
TV/CAMERA INPUT SELECTOR C.B.A. (VEP00231A)


EAMG3
94V-1
S6303
S6303-2
S6303-4
S6303-1
S6303-3
P604
P603
3
2
1
10
8
6
4
2
1
VJB00231
D.L TUNER AUDIO OUT
AUX IN
AUDIO OUT
TUNER AUDIO IN
CAMERA IN
VIDEO OUT
TUNER VIDEO IN

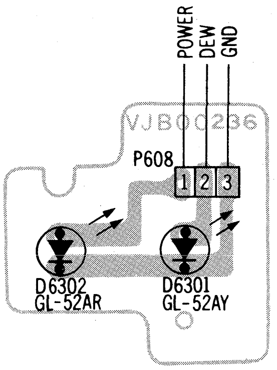
MIC JACK CONNECTION C.B.A. (VEP00227A)


J6303
R6303
100K
R6302
330
5
3
1
GND
AUDIO IN
GND
AUDIO OUT
GND
VJB00227
EAMG3
94V-1

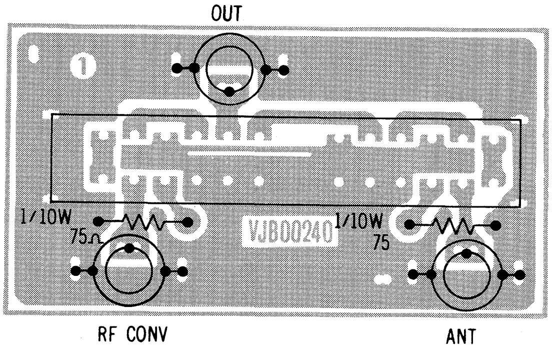
AFC LAMP C.B.A. (VEP00235A)


AFC ON +12V
GL-52PG
D6303
VJB00235

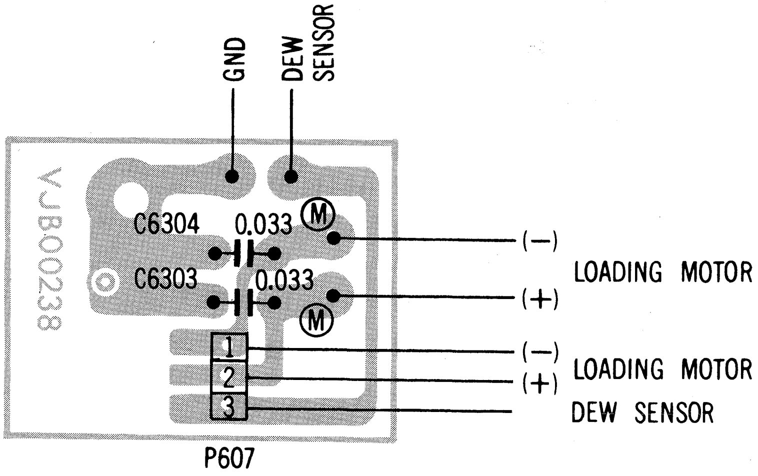
LIGHT EMITTING DIODE C.B.A. (VEP00236A)


POWER
DEW
GND
VJB00236
P608
1
2
3
D6302
GL-52AR
D6301
GL-52AY

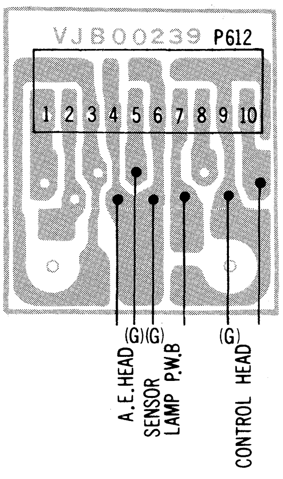
ANTENNA SELECTOR C.B.A. (VEP00240A)


OUT
1/10W
75Ω
VJB00240
1/10W
75
RF CONV
ANT

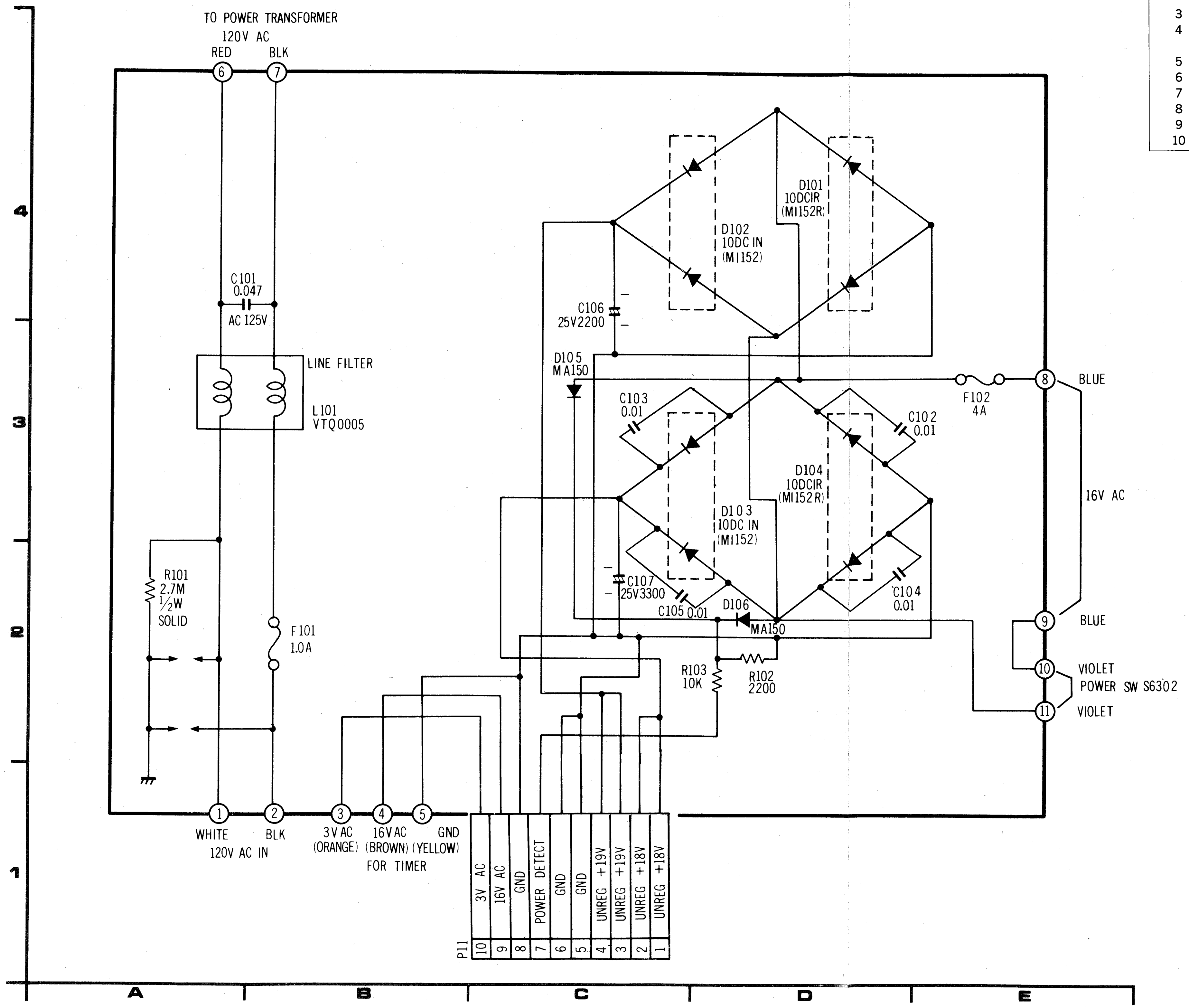
LOADING MOTOR CONNECTION C.B.A. (VEP00238A)


GND
DEW SENSOR
VJB00238
C6304
0.033
C6303
0.033
M
M
(−)
(+)
LOADING MOTOR
1
2
3
(−)
(+)
LOADING MOTOR
DEW SENSOR
P607

AUDIO/CONTROL HEAD CONNECTION C.B.A. (VEP00239A)


VJB00239
P612
1 2 3 4 5 6 7 8 9 10
(G)(G)
(G)
A.E.HEAD
SENSOR LAMP P.W.B
CONTROL HEAD

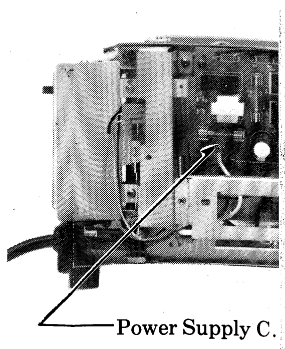
POWER SUPPLY SCHEMATIC DIAGRAM

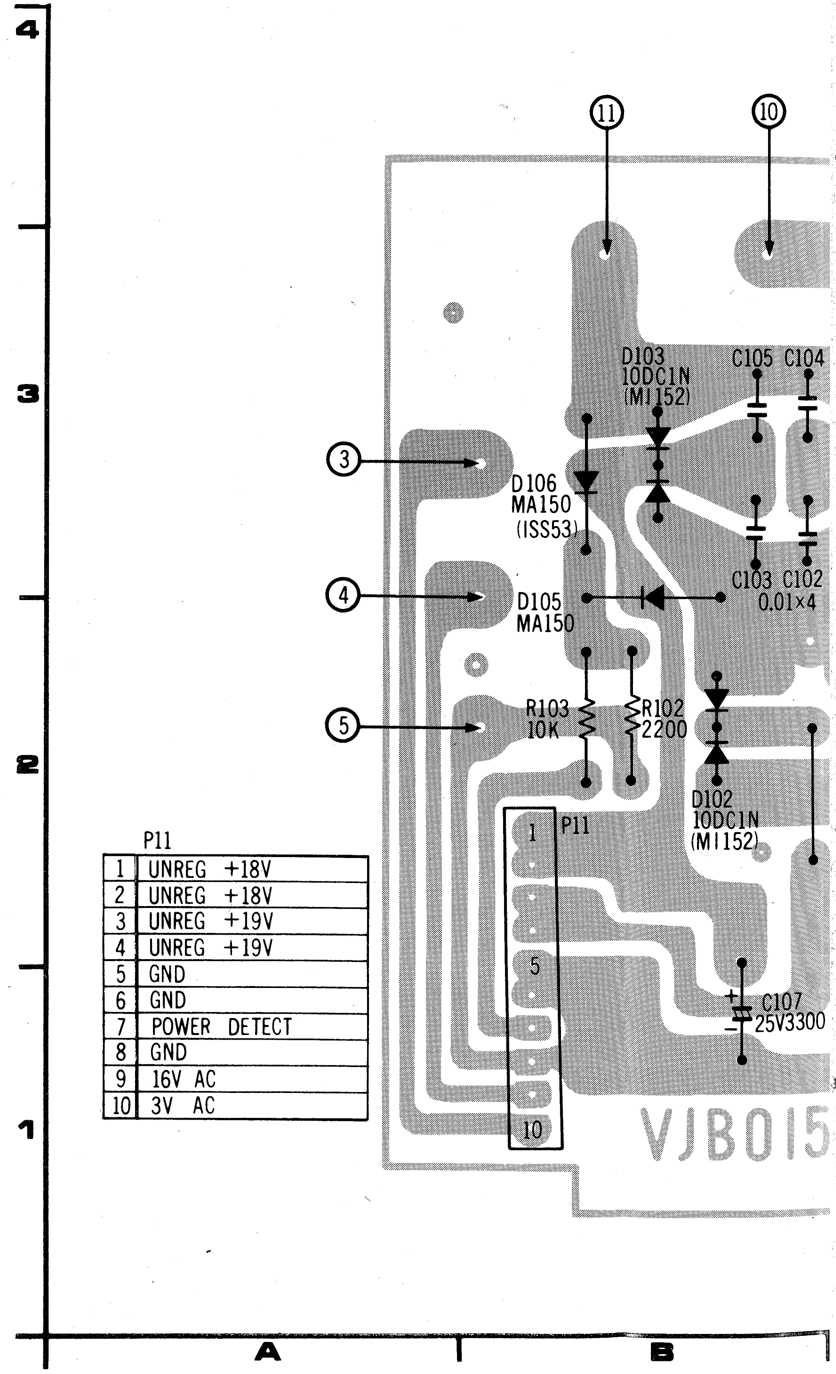

TO POWER TRANSFORMER
120V AC
RED
BLK
C101
0.047
AC 125V
LINE FILTER
L101
VTQ0005
R101
2.7M
½W
SOLID
F101
1.0A
WHITE
BLK
120V AC IN
3V AC
(ORANGE)
16V AC
(BROWN)
GND
(YELLOW)
FOR TIMER
C106
25V2200
D105
MA150
D102
10DC IN
(MI152)
D101
10DCIR
(MI152R)
C103
0.01
C102
0.01
D104
10DCIR
(MI152R)
D103
10DC IN
(MI152)
C107
25V3300
C105 0.01
D106
MA150
C104
0.01
R103
10K
R102
2200
F102
4A
BLUE
16V AC
BLUE
VIOLET
POWER SW S6302
VIOLET
3V AC
16V AC
GND
POWER DETECT
GND
GND
UNREG +19V
UNREG +19V
UNREG +18V
UNREG +18V
P11
10
9
8
7
6
5
4
3
2
1
A
B
C
D
E

POWER SUPPLY CIRCUIT BOARD

P11 (Power Supply C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	Unreg. +18V	P62-8 (Reg. & Transport)
2	Unreg. +18V	SL6301 (Stop Sol.)/ P63-6 (Reg. & Transport)
3	Unreg. +19V	P62-3 (Reg. & Transport)
4	Unreg. +19V	SL6302 (Pressure Roller Sol.)/ P64-9 (Reg. & Transport)
5	GND	P614-1 (Reel Sensor)
6	GND	P62-5 (Reg. & Transport)
7	Power Detect	P62-7 (Reg. & Transport)
8	GND	③ (Digital Timer)
9	16V AC	② (Digital Timer)
10	3V AC	⑤ (Digital Timer)


Power Supply C.

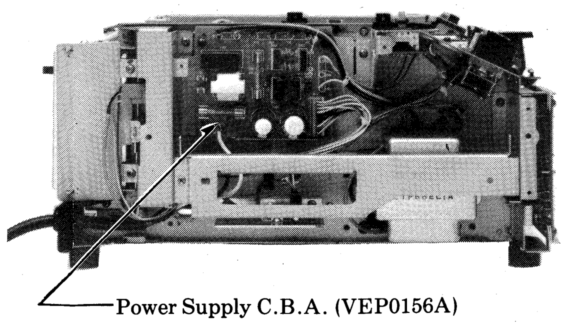

4
3
2
1
A
B
11
10
3
4
5
D103
10DC1N
(MI152)
C105 C104
D106
MA150
(ISS53)
C103 C102
0.01×4
D105
MA150
R103
10K
R102
2200
D102
10DC1N
(MI152)
P11
1
5
10
C107
25V3300
P11
1 UNREG +18V
2 UNREG +18V
3 UNREG +19V
4 UNREG +19V
5 GND
6 GND
7 POWER DETECT
8 GND
9 16V AC
10 3V AC
VJB015

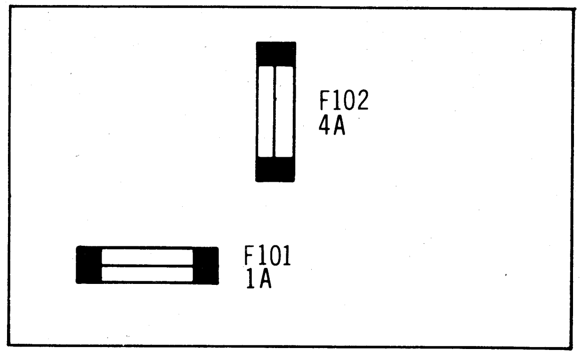
AM

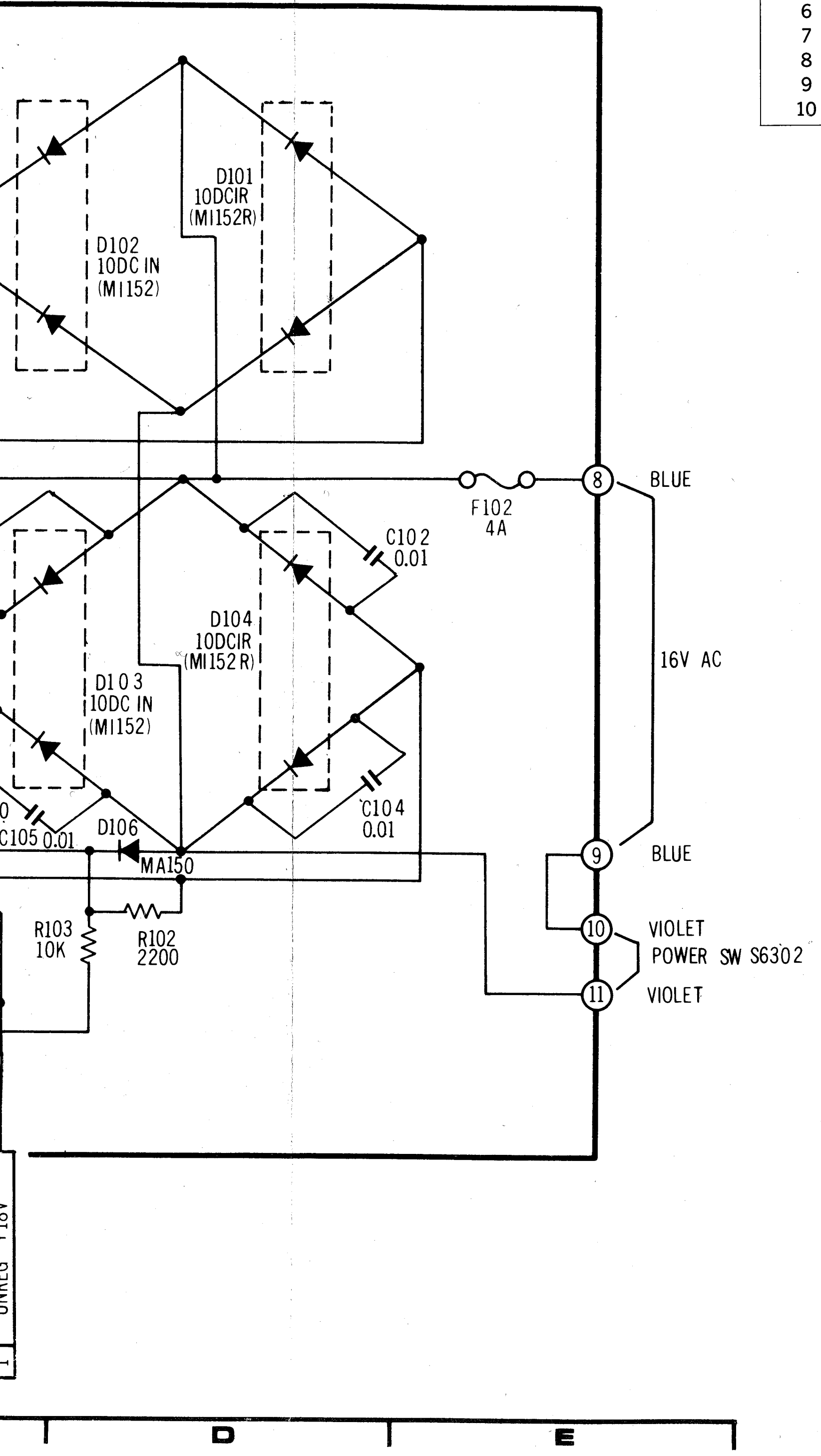
POWER SUPPLY CIRCUIT BOARD (VEP0156A)

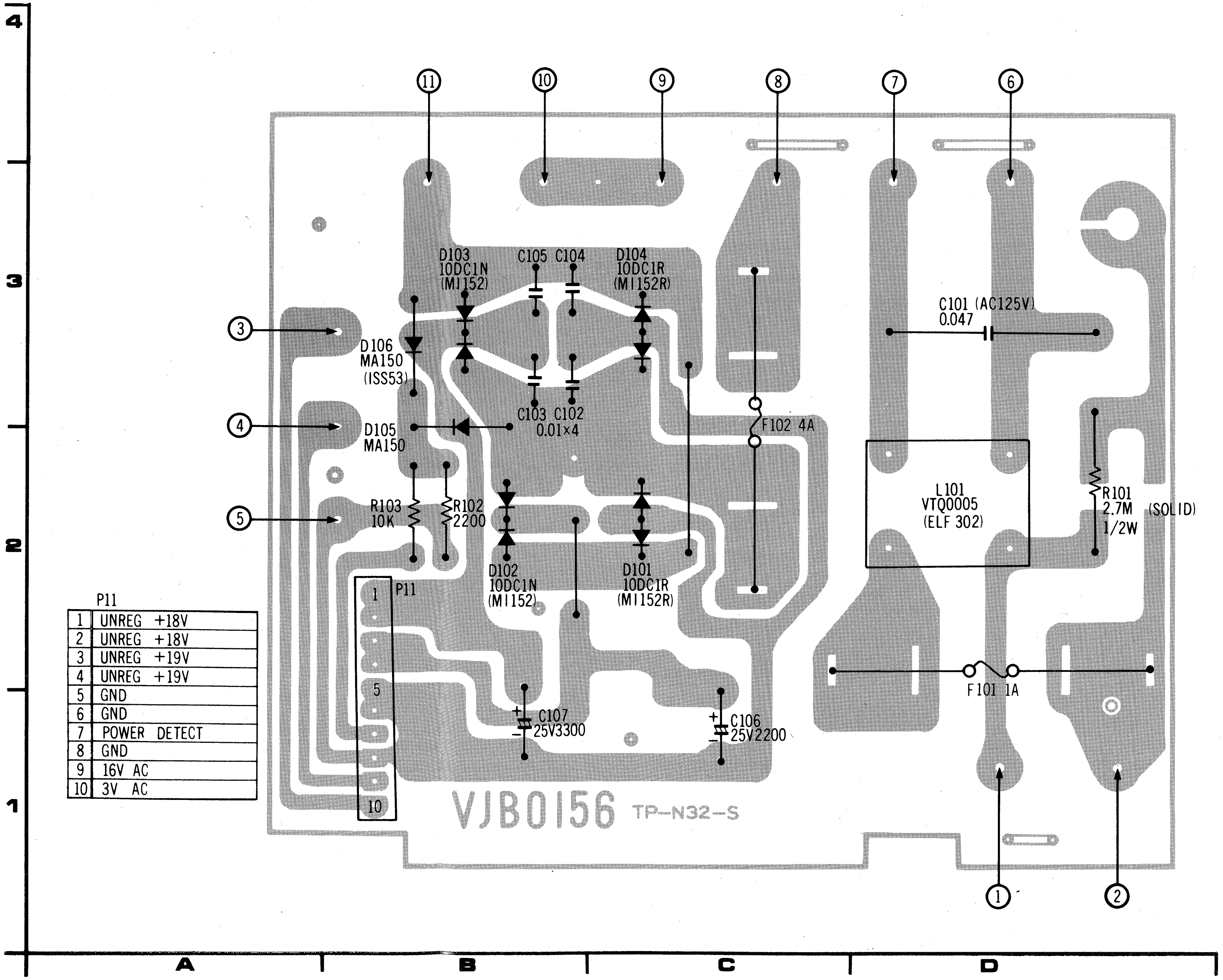
P11 (Power Supply C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	Unreg. +18V	P62-8 (Reg. & Transport)
2	Unreg. +18V	SL6301 (Stop Sol.)/ P63-6 (Reg. & Transport)
3	Unreg. +19V	P62-3 (Reg. & Transport)
4	Unreg. +19V	SL6302 (Pressure Roller Sol.)/ P64-9 (Reg. & Transport)
5	GND	P614-1 (Reel Sensor)
6	GND	P62-5 (Reg. & Transport)
7	Power Detect	P62-7 (Reg. & Transport)
8	GND	③ (Digital Timer)
9	16V AC	② (Digital Timer)
10	3V AC	⑤ (Digital Timer)


Power Supply C.B.A. (VEP0156A)


F102
4A
F101
1A


D101
10DCIR
(MI152R)
D102
10DC IN
(MI152)
F102
4A
⑧
BLUE
C102
0.01
D104
10DCIR
(MI152R)
D103
10DC IN
(MI152)
16V AC
C104
0.01
C105 0.01
D106
MA150
⑨
BLUE
R103
10K
R102
2200
⑩
VIOLET
POWER SW S6302
⑪
VIOLET
D
E


4
3
2
1
⑪
⑩
⑨
⑧
⑦
⑥
D103
10DC1N
(MI152)
C105 C104
D104
10DC1R
(MI152R)
C101 (AC125V)
0.047
③
D106
MA150
(ISS53)
④
D105
MA150
C103 C102
0.01×4
F102 4A
L101
VTQ0005
(ELF 302)
R101
2.7M (SOLID)
1/2W
⑤
R103
10K
R102
2200
D102
10DC1N
(MI152)
D101
10DC1R
(MI152R)
P11
1
5
10
P11
1 UNREG +18V
2 UNREG +18V
3 UNREG +19V
4 UNREG +19V
5 GND
6 GND
7 POWER DETECT
8 GND
9 16V AC
10 3V AC
C107
25V3300
C106
25V2200
F101 1A
VJB0156 TP-N32-S
①
②
A
B
C
D

Reg. & Transport Circuit	
Q601	D-2
Q602	F-2
Q603	F-3
Q604	D-3
Q605	D-3
Q606	D-3
Q607	D-3
Q608	D-3
Q609	D-2
Q610	D-2
Q611	E-3
Q612	E-3
Q613	G-3
Q614	C-3
Q615	C-3
Q616	C-3
Q617	C-3
Q618	C-2
Q619	G-2
Q620	G-3
Q621	F-3
Q622	F-3
Q623	F-3
Q624	F-3
Q625	H-3
Q626	B-3
Q627	B-3
Q628	B-3
Q629	A-2
Q630	A-2
Q631	A-3
Q632	A-2
Q633	A-2
Q634	A-3
D601	E-2
D602	E-2
D603	G-2
D604	E-2
D605	E-2
D606	D-2
D607	E-2
D608	C-3
D609	F-2
D610	E-2
D611	E-3
D613	F-2
D614	F-3
D615	E-3
D616	E-3
D617	F-2
D618	C-3
D619	C-3
D620	C-2
D621	G-3
D622	G-3
D623	F-3
D624	E-3
D625	F-3
D626	G-3
D627	B-3
D628	A-2
D629	A-2
D630	B-3
D635	A-3

P61 (Regulator & Transport C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	Power TR-E	P621-3 (Power TR)
2	Power TR-C	P621-2 (Power TR)
3	Power TR-B	P621-1 (Power TR)

P62 (Regulator & Transport C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	Preset Time	④ (Digital Timer)
2	Timer SW	① (Digital Timer)
3	Unreg. +19V	P11-3 (Power Supply)
4	GND	P602-3 (Mic Jack Connection)
5	GND	P11-6 (Power Supply)
6	GND	P605-3 (Capstan Motor)
7	Power Detect	P11-7 (Power Supply)
8	Unreg. +18V	P11-1 (Power Supply)
9	+12V	P22-1 (Servo)
10	+12V	P33-5 (Luminance Process)

P63 (Regulator & Transport C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	Unloading Completion Ⓛ	P606-1 (Loading/ Unloading Completion Switches)
2	Unloading Completion Ⓛ	P22-9 (Servo)
3	Dew. Sensor	P607-3 (Loading Motor Connection)
4	Dew. LED	P508-2 (Light Emitting Diode)
5	—	—
6	Stop Solenoid	SL6301 (Stop Sol.)/ P11-2 (Power Supply) P613-1 (Tape Slack SW)
7	Loading Motor	P607-2 (Loading Motor Connection)
8	Loading Motor	P607-1 (Loading Motor Connection)
9	—	—
10	Supply Photo TR	Q6302-C (Supply Photo TR Connection)

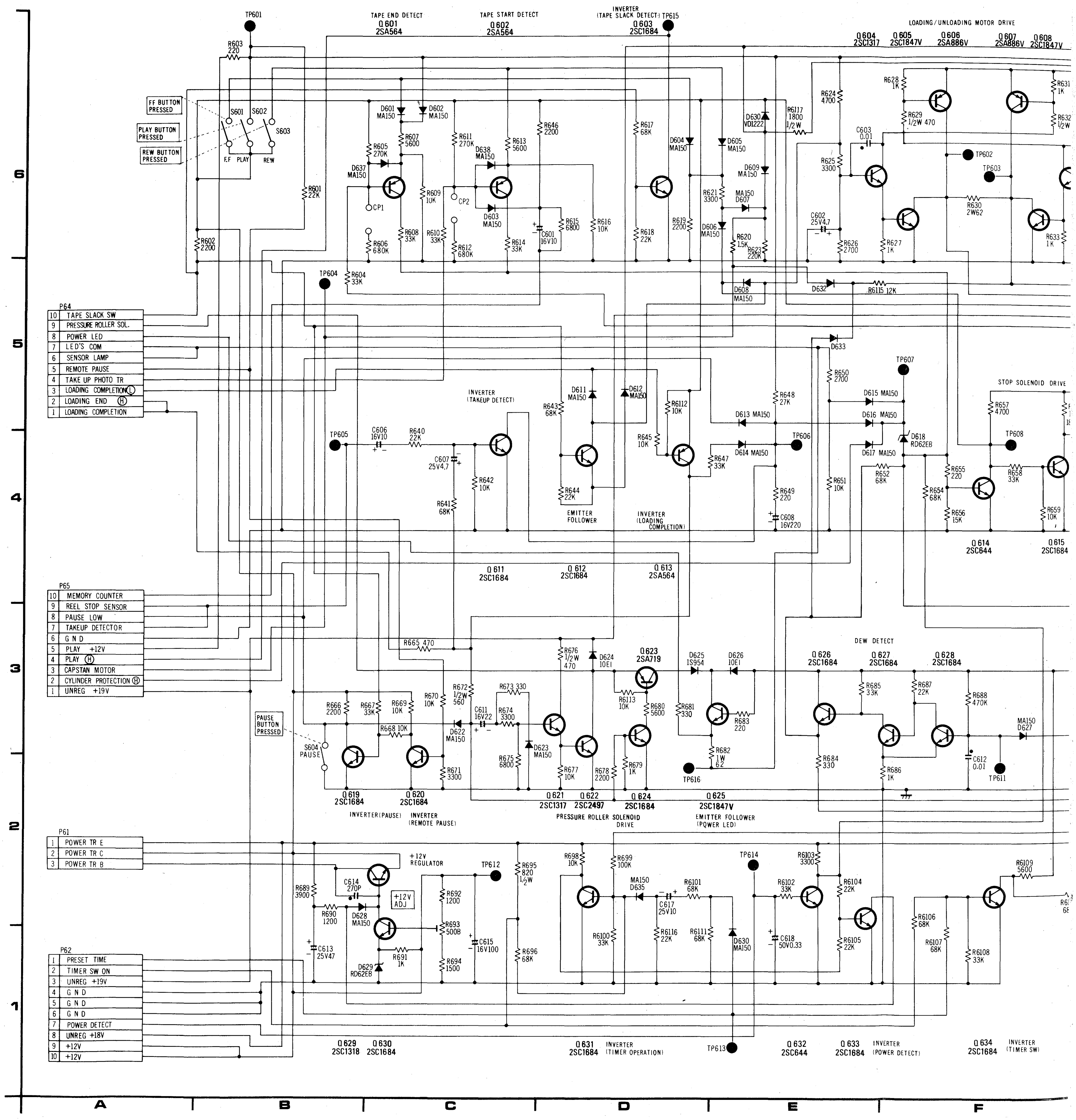
P64 (Regulator & Transport C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	Loading Completion Ⓗ	P42-2 (Audio)
2	—	—
3	Loading Completion Ⓛ	P606-2 (Loading/ Unloading Completion Switches)
4	Takeup Photo TR	Q6303-C (Takeup Photo TR Connection)
5	Remote Pause	P601-3 (Rear Jack)
6	Sensor Lamp	P612-3 (Audio/Control Head Connection)
7	LED's COM	P508-3 (Light Emitting Diode)
8	Power LED	P508-1 (Light Emitting Diode)
9	Pressure Roller Sol.	SL6302 (Pressure Roller Sol.)/ P11-4 (Power Supply)
10	Tape Slack SW	P613-2 (Tape Slack SW)

P65 (Regulator & Transport C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	Unreg. +19V	P22-8 (Servo)
2	Cylinder Protection	P22-10 (Servo)
3	Capstan +12V	P21-10 (Servo)
4	Play Ⓗ	P44-4 (Audio)
5	Play +12V	P22-7 (Servo)
6	GND	P22-4 (Servo)
7	Takeup Detector	P614-2 (Reel Sensor)
8	Pause Ⓛ	P42-1 (Audio)
9	—	—
10	Memory Counter	S6307 (Tape Counter SW)

REGULATOR & TRANSPORT SCHEMATIC DIAGRAM



TP601
TAPE END DETECT
Q601 2SA564
TAPE START DETECT
Q602 2SA564
INVERTER (TAPE SLACK DETECT)
Q603 2SC1684
TP615
LOADING/UNLOADING MOTOR DRIVE
Q604 2SC1317
Q605 2SC1847V
Q606 2SA886V
Q607 2SA886V
Q608 2SC1847V
FF BUTTON PRESSED
PLAY BUTTON PRESSED
REW BUTTON PRESSED
S601
S602
S603
FF
PLAY
REW
P64
10 TAPE SLACK SW
9 PRESSURE ROLLER SOL.
8 POWER LED
7 LED'S COM
6 SENSOR LAMP
5 REMOTE PAUSE
4 TAKE UP PHOTO TR
3 LOADING COMPLETION Ⓛ
2 LOADING END Ⓗ
1 LOADING COMPLETION
INVERTER (TAKEUP DETECT)
EMITTER FOLLOWER
INVERTER (LOADING COMPLETION)
Q611 2SC1684
Q612 2SC1684
Q613 2SA564
STOP SOLENOID DRIVE
Q614 2SC644
Q615 2SC1684
P65
10 MEMORY COUNTER
9 REEL STOP SENSOR
8 PAUSE LOW
7 TAKEUP DETECTOR
6 GND
5 PLAY +12V
4 PLAY Ⓗ
3 CAPSTAN MOTOR
2 CYLINDER PROTECTION Ⓓ
1 UNREG +19V
DEW DETECT
Q626 2SC1684
Q627 2SC1684
Q628 2SC1684
Q623 2SA719
PAUSE BUTTON PRESSED
S604 PAUSE
Q619 2SC1684
Q620 2SC1684
INVERTER(PAUSE)
INVERTER (REMOTE PAUSE)
Q621 2SC1317
Q622 2SC2497
Q624 2SC1684
PRESSURE ROLLER SOLENOID DRIVE
Q625 2SC1847V
EMITTER FOLLOWER (POWER LED)
P61
1 POWER TR E
2 POWER TR C
3 POWER TR B
+12V REGULATOR
+12V ADJ
P62
1 PRESET TIME
2 TIMER SW ON
3 UNREG +19V
4 GND
5 GND
6 GND
7 POWER DETECT
8 UNREG +18V
9 +12V
10 +12V
Q629 2SC1318
Q630 2SC1684
Q631 2SC1684 INVERTER (TIMER OPERATION)
TP613
Q632 2SC644
Q633 2SC1684 INVERTER (POWER DETECT)
Q634 2SC1684 INVERTER (TIMER SW)
6
5
4
3
2
1
A
B
C
D
E
F

REGULATOR & TRANSPORT SCHEMATIC DIAGRAM

witches)

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Supply)

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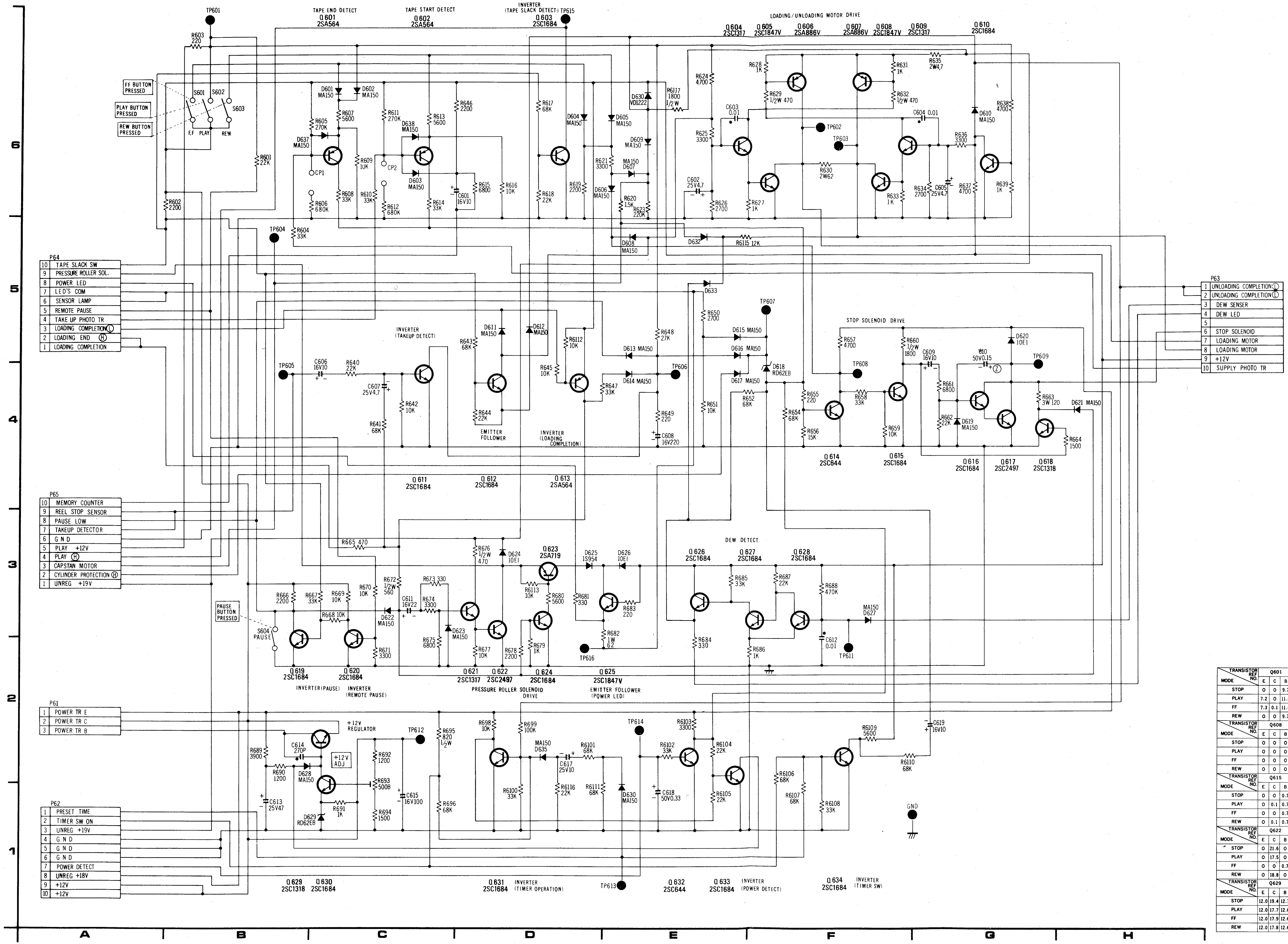

TP601
R603 220
TAPE END DETECT
Q601 2SA564
TAPE START DETECT
Q602 2SA564
INVERTER (TAPE SLACK DETECT) TP615
Q603 2SC1684
LOADING/UNLOADING MOTOR DRIVE
Q604 2SC1317
Q605 2SC1847V
Q606 2SA886V
Q607 2SA886V
Q608 2SC1847V
Q609 2SC1317
Q610 2SC1684
FF BUTTON PRESSED
PLAY BUTTON PRESSED
REW BUTTON PRESSED
S601
S602
S603
F.F
PLAY
REW
TP602
TP603
TP604
TP605
TP606
TP607
TP608
TP609
P64
10 TAPE SLACK SW
9 PRESSURE ROLLER SOL.
8 POWER LED
7 LED'S COM
6 SENSOR LAMP
5 REMOTE PAUSE
4 TAKE UP PHOTO TR
3 LOADING COMPLETION Ⓛ
2 LOADING END Ⓗ
1 LOADING COMPLETION
P63
1 UNLOADING COMPLETION Ⓛ
2 UNLOADING COMPLETION Ⓛ
3 DEW SENSER
4 DEW LED
5
6 STOP SOLENOID
7 LOADING MOTOR
8 LOADING MOTOR
9 +12V
10 SUPPLY PHOTO TR
INVERTER (TAKEUP DETECT)
EMITTER FOLLOWER
INVERTER (LOADING COMPLETION)
STOP SOLENOID DRIVE
Q611 2SC1684
Q612 2SC1684
Q613 2SA564
Q614 2SC644
Q615 2SC1684
Q616 2SC1684
Q617 2SC2497
Q618 2SC1318
P65
10 MEMORY COUNTER
9 REEL STOP SENSOR
8 PAUSE LOW
7 TAKEUP DETECTOR
6 GND
5 PLAY +12V
4 PLAY Ⓗ
3 CAPSTAN MOTOR
2 CYLINDER PROTECTION Ⓗ
1 UNREG +19V
PAUSE BUTTON PRESSED
S604 PAUSE
Q619 2SC1684
Q620 2SC1684
INVERTER (PAUSE)
INVERTER (REMOTE PAUSE)
Q621 2SC1317
Q622 2SC2497
Q623 2SA719
Q624 2SC1684
PRESSURE ROLLER SOLENOID DRIVE
Q625 2SC1847V
EMITTER FOLLOWER (POWER LED)
DEW DETECT
Q626 2SC1684
Q627 2SC1684
Q628 2SC1684
TP616
TP611
P61
1 POWER TR E
2 POWER TR C
3 POWER TR B
+12V REGULATOR
+12V ADJ
TP612
TP614
P62
1 PRESET TIME
2 TIMER SW ON
3 UNREG +19V
4 GND
5 GND
6 GND
7 POWER DETECT
8 UNREG +18V
9 +12V
10 +12V
Q629 2SC1318
Q630 2SC1684
Q631 2SC1684 INVERTER (TIMER OPERATION)
TP613
Q632 2SC644
Q633 2SC1684 INVERTER (POWER DETECT)
Q634 2SC1684 INVERTER (TIMER SW)
GND
6
5
4
3
2
1
A
B
C
D
E
F
G
H

TRANSISTOR REF NO. / MODE	Q601			Q602			Q603			Q604			Q605			Q606			Q607		
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	C
STOP	0	0	9.7	0	0	9.6	0	0	0.6	0	21.5	0	0	0	0	21.5	0	21.5	21.5	0	21.5
PLAY	7.2	0	11.5	0.1	0.1	9.7	0	11.4	0	0	18.7	0.3	0	0	0	18.6	0.1	18.7	18.6	0	18.6
FF	7.3	0.1	11.6	0.1	0	9.7	0	0	0.6	0	19.1	0.2	0	0.1	0	19.1	0	19.1	19.1	0.1	19.1
REW	0	0	9.7	7.7	0	11.5	0	0	0.6	0	19.0	0.2	0	0	0	19.0	0	19.0	18.9	0	18.9

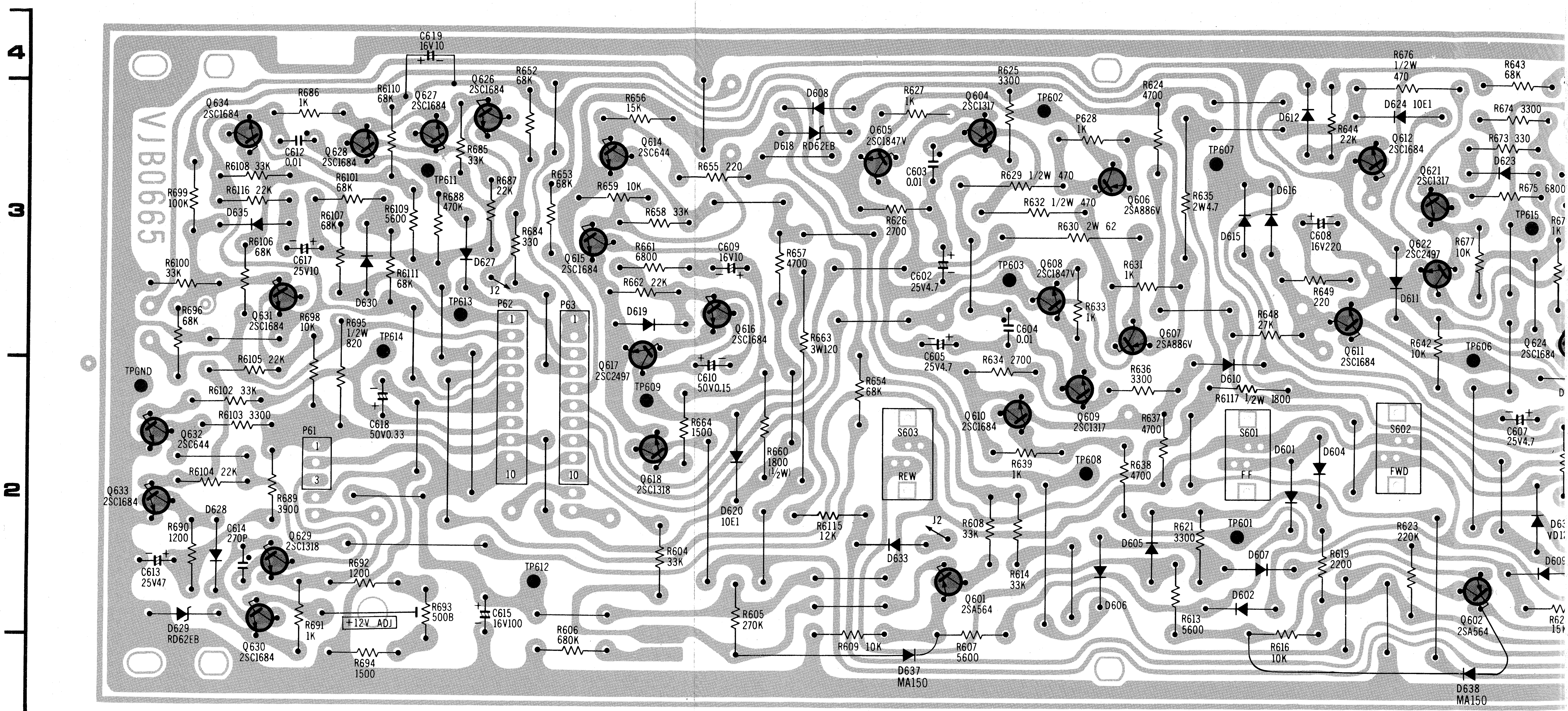
TRANSISTOR REF NO. / MODE	Q608			Q609			Q610			Q611			Q612			Q613			Q614		
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0	0	0	0	21.5	0.3	0	0.7	0	0	0.3	0	0.4	0.4	1.0	12.0	0	12.0	0	17.8	0
PLAY	0	0	0	0	18.9	0	0	0	0.7	0	0.3	0	0	0.7	0	0	11.9	11.3	0	16.5	0.1
FF	0	0	0	0	19.1	0.3	0	0.6	0.1	0	0	-0.5	0.4	0.4	1.0	11.9	0	11.9	0	16.5	0
REW	0	0	0	0	18.9	0.3	0	0.7	0	0	0	-0.5	0.4	0.4	1.0	12.0	0	12.0	0	16.4	0

TRANSISTOR REF NO. / MODE	Q615			Q616			Q617			Q618			Q619			Q620			Q621		
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0	0	0.7	0	20.0	0	0	20.0	0	0	20.0	0	0	0	0.7	0	6.4	0	0	21.5	0
PLAY	0	0.1	0.7	0	18.9	0	0	18.9	0	0	18.8	0.1	0	11.4	0	0	0	0.6	0	18.6	0
FF	0	0	0.7	0	18.7	0	0	18.7	0	0	18.7	0	0	0	0.7	0	6.4	0	0	0	0
REW	0	0.1	0.7	0	18.7	0	0	18.6	0	0	18.7	0	0	0	0.7	0	6.4	0	0	19.2	0

TRANSISTOR REF NO. / MODE	Q622			Q623			Q624			Q625			Q626			Q627			Q628		
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0	21.6	0	21.5	0	21.5	0	21.5	0	10.9	11.2	11.6	0.3	12.0	0.8	0.8	0.8	1.5	0.8	1.5	0.5
PLAY	0	17.5	0	17.5	17.2	16.7	0	0	0.8	11.0	16.1	11.7	0.3	12.0	0.8	0.8	0.8	1.5	0.8	1.5	0.5
FF	0	0	0.7	18.8	0	18.8	0	18.8	0	10.9	11.2	11.6	0.3	12.0	0.8	0.8	0.8	1.5	0.8	1.5	0.5
REW	0	18.8	0	19.5	0.1	19.5	0	19.3	0	10.9	11.2	11.6	0.3	12.0	0.8	0.8	0.8	1.5	12.0	17.9	12.6

TRANSISTOR REF NO. / MODE	Q629			Q630			Q631			Q632			Q633			Q634					
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B			
STOP	12.0	19.4	12.7	6.1	12.6	6.7	0	0	0.7	0	0	0.7	0	13.2	0	0	0	0.7			
PLAY	12.0	17.7	12.6	6.1	12.6	6.7	0	0	0.7	0	0	0.7	0	13.3	0	0	0	0.7			
FF	12.0	17.9	12.6	6.1	12.6	6.7	0	0	0.7	0	0	0.7	0	13.3	0.1	0	0	0.7			
REW	12.0	17.8	12.6	6.1	12.6	6.7	0	0	0.6	0	0.1	0.7	0	13.3	0	0	0	0.7			

REGULATOR & TRANSPORT CIRCUIT BOARD (VEP0665A1)


4
3
2
1
A
B
C
D
E
F
VJB0665
C619 16V10
Q634 2SC1684
R686 1K
R6110 68K
Q627 2SC1684
Q626 2SC1684
R652 68K
C612 0.01
Q628 2SC1684
R685 33K
R6108 33K
R6101 68K
TP611
R687 22K
R699 100K
R6116 22K
R6107 68K
R6109 5600
R688 470K
R653 68K
R684 330
D635
R6106 68K
C617 25V10
D627
R6100 33K
R6111 68K
J2
D630
TP613
P62
P63
R696 68K
Q631 2SC1684
R698 10K
R695 1/2W 820
TP614
TPGND
R6105 22K
R6102 33K
C618 50V0.33
R6103 3300
Q632 2SC644
P61
R6104 22K
R689 3900
Q633 2SC1684
D628
R690 1200
C614 270P
Q629 2SC1318
C613 25V47
R692 1200
TP612
R693 500B
C615 16V100
D629 RD62EB
Q630 2SC1684
R691 1K
+12V ADJ
R694 1500
R606 680K
R656 15K
Q614 2SC644
R655 220
R659 10K
R658 33K
Q615 2SC1684
R661 6800
C609 16V10
R662 22K
D619
Q616 2SC1684
Q617 2SC2497
TP609
C610 50V0.15
R664 1500
Q618 2SC1318
R604 33K
D620 10E1
R605 270K
D608
D618 RD62EB
R657 4700
R663 3W120
R660 1800 (1/2W)
R6115 12K
S603
REW
D633
R609 10K
D637 MA150
R627 1K
Q605 2SC1847V
C603 0.01
R626 2700
C602 25V4.7
C605 25V4.7
R654 68K
R625 3300
Q604 2SC1317
TP602
P628 1K
R629 1/2W 470
R632 1/2W 470
R630 2W 62
Q606 2SA886V
TP603
Q608 2SC1847V
R633 1K
C604 0.01
R634 2700
Q607 2SA886V
Q610 2SC1684
Q609 2SC1317
R639 1K
TP608
R608 33K
R614 33K
Q601 2SA564
R607 5600
D606
D605
R624 4700
TP607
R635 2W4.7
R631 1K
R636 3300
R637 4700
R638 4700
R621 3300
R613 5600
D612
D616
D615
R648 27K
D610
R6117 1/2W 1800
S601
FF
D601
D604
TP601
D607
D602
R616 10K
D638 MA150
R676 1/2W 470
D624 10E1
R644 22K
Q612 2SC1684
C608 16V220
R649 220
Q611 2SC1684
S602
FWD
R619 2200
R643 68K
R674 3300
R673 330
D623
Q621 2SC1317
R675 6800
TP615
R677 10K
Q622 2SC2497
D611
R642 10K
TP606
Q624 2SC1684
C607 25V4.7
R623 220K
Q602 2SA564
D609

P61

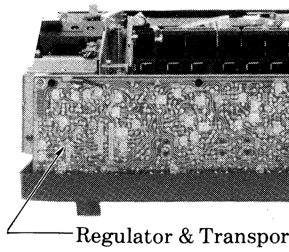
1	POWER TR E
2	POWER TR C
3	POWER TR B

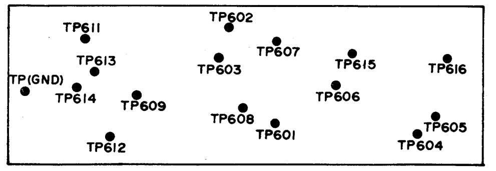
P62

1	PRESET TIME
2	TIMER SW
3	UNREG +19V
4	GND
5	GND
6	GND
7	POWER DETECT
8	UNREG +18V
9	+12V
10	+12V

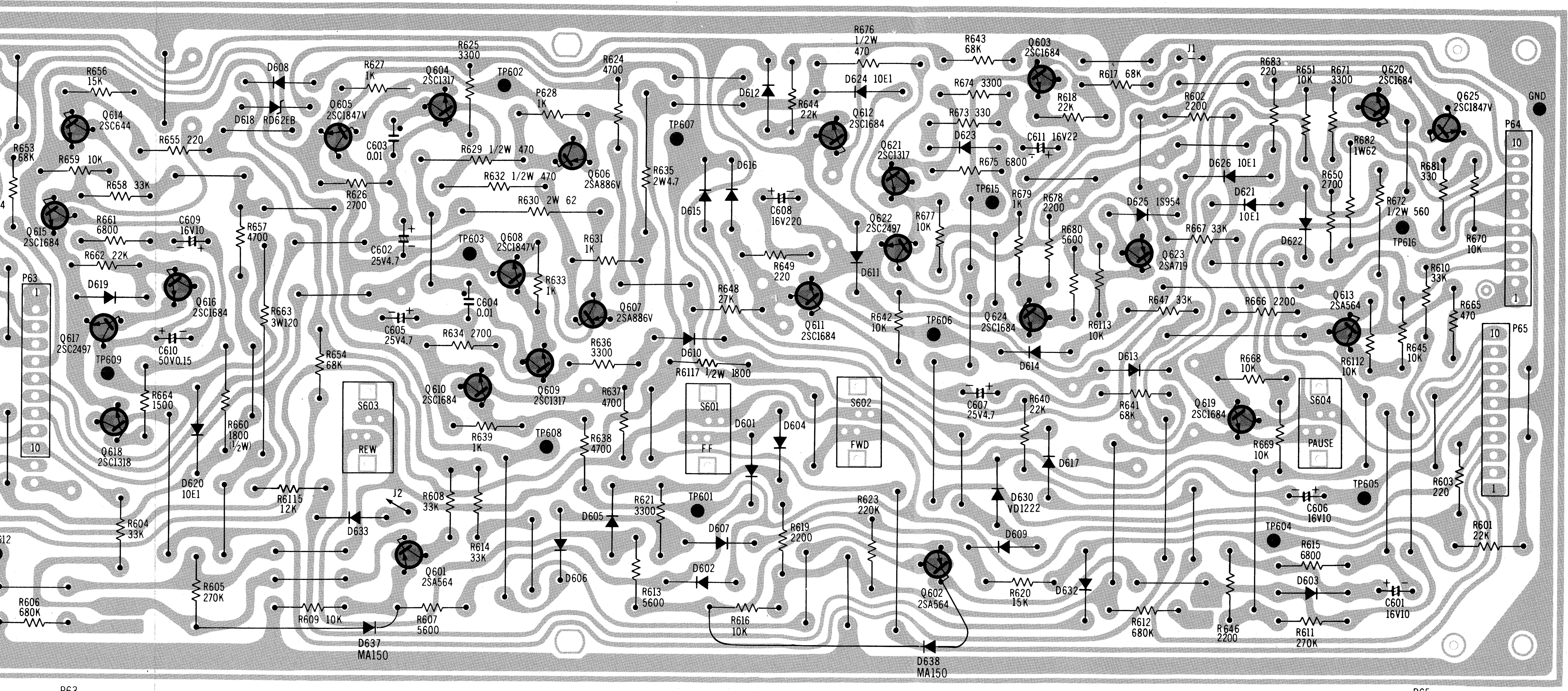
P63

1	UNLOADING COMPLETION Ⓛ
2	UNLOADING COMPLETION Ⓛ
3	DEW SENSOR
4	DEW LED
5	
6	STOP SOLENOID
7	LOADING MOTOR
8	LOADING MOTOR
9	
10	SUPPLY PHOTO TR

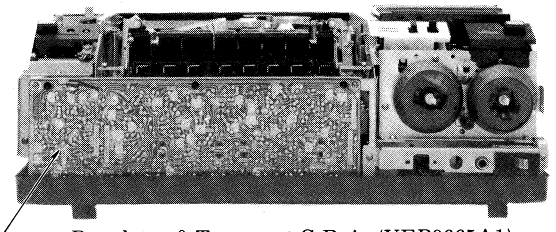

Regulator & Transport C.B.A. (VEP0665A1)

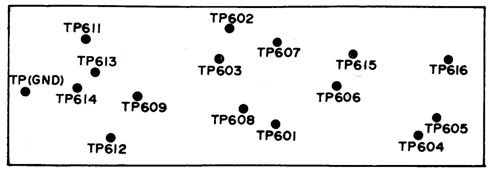

TP611
TP602
TP613
TP603
TP607
TP615
TP616
TP(GND)
TP614
TP609
TP606
TP608
TP601
TP605
TP612
TP604

T BOARD (VEP0665A1)


R656 15K
Q614 2SC644
R653 68K
R659 10K
R655 220
R658 33K
Q615 2SC1684
R661 6800
C609 16V10
R662 22K
R657 4700
D619
Q616 2SC1684
P63
Q617 2SC2497
C610 50V0.15
TP609
R663 3W120
R654 68K
R664 1500
Q618 2SC1318
R660 1800 (1/2W)
D620 10E1
R6115 12K
R604 33K
R605 270K
R606 680K
R609 10K
D637 MA150
R607 5600
D608
D618 RD62EB
Q605 2SC1847V
R627 1K
Q604 2SC1317
R625 3300
TP602
C603 0.01
R626 2700
R629 1/2W 470
R628 1K
Q606 2SA886V
R632 1/2W 470
R630 2W 62
C602 25V4.7
TP603
Q608 2SC1847V
R633 1K
R631 1K
C604 0.01
C605 25V4.7
R634 2700
Q607 2SA886V
R636 3300
Q609 2SC1317
Q610 2SC1684
R637 4700
S603 REW
R639 1K
TP608
R638 4700
J2
R608 33K
D633
R614 33K
Q601 2SA564
R624 4700
R635 2W4.7
TP607
D615
D616
D612
R644 22K
C608 16V220
R649 220
R648 27K
D610
R6117 1/2W 1800
S601 FF
D601
D604
D605
R621 3300
TP601
D607
D606
R613 5600
D602
R616 10K
R619 2200
D638 MA150
R676 1/2W 470
D624 10E1
Q612 2SC1684
Q611 2SC1684
R642 10K
TP606
D611
S602 FWD
R623 220K
Q602 2SA564
R643 68K
Q603 2SC1684
R674 3300
R673 330
D623
R675 6800
Q621 2SC1317
TP615
Q622 2SC2497
R677 10K
R679 1K
R678 2200
C611 16V22
R618 22K
R617 68K
J1
Q624 2SC1684
D614
C607 25V4.7
R640 22K
D617
D630 VD1222
D609
R620 15K
D632
R612 680K
R680 5600
R6113 10K
D625 1S954
Q623 2SA719
R602 2200
D626 10E1
D621 10E1
R667 33K
R647 33K
D613
R641 68K
Q619 2SC1684
R668 10K
R669 10K
S604 PAUSE
TP604
R615 6800
D603
R646 2200
R611 270K
R683 220
R651 10K
R671 3300
Q620 2SC1684
R682 1W62
R650 2700
D622
R672 1/2W 560
R666 2200
Q613 2SA564
R6112 10K
R645 10K
Q625 2SC1847V
R681 330
TP616
R670 10K
R610 33K
R665 470
GND
P64
P65
C606 16V10
TP605
R603 220
R601 22K
C601 16V10

	P63
1	UNLOADING COMPLETION Ⓛ
2	UNLOADING COMPLETION Ⓛ
3	DEW SENSOR
4	DEW LED
5	
6	STOP SOLENOID
7	LOADING MOTOR
8	LOADING MOTOR
9	
10	SUPPLY PHOTO TR


Regulator & Transport C.B.A. (VEP0665A1)

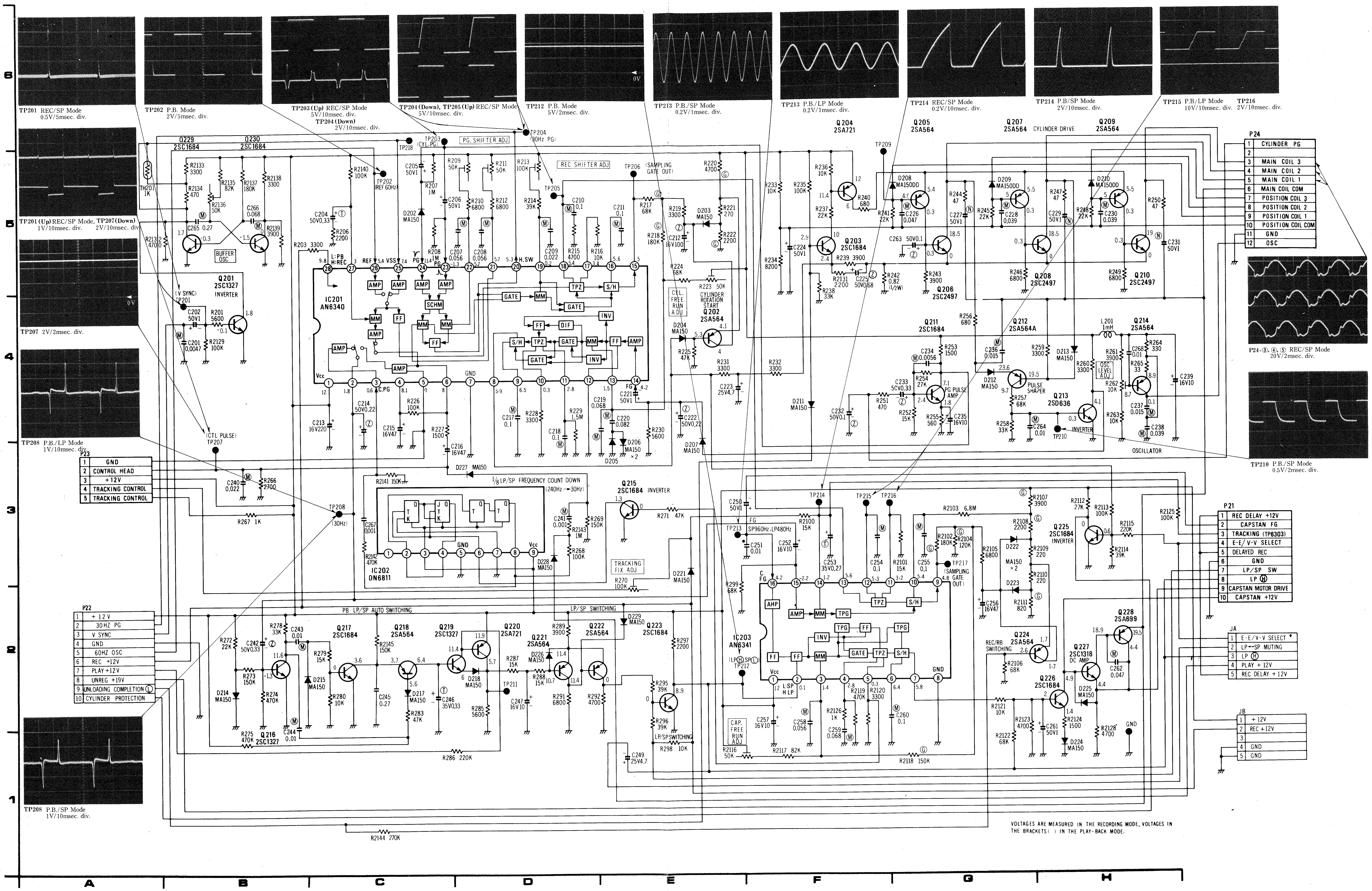

TP611
TP602
TP613
TP607
TP603
TP615
TP616
TP(GND)
TP614
TP609
TP606
TP608
TP601
TP605
TP612
TP604

	P64
1	LOADING COMPLETION Ⓗ
2	
3	LOADING COMPLETION Ⓛ
4	TAKEUP PHOTO TR
5	REMOTE PAUSE
6	SENSOR LAMP
7	LED'S COM
8	POWER LED
9	PRESSURE ROLLER SOLENOID
10	TAPE SLACK SW

	P65
1	UNREG +19V
2	CYLINDER PROTECTION
3	CAPSTAN +12V
4	PLAY Ⓗ
5	PLAY +12V
6	GND
7	TAKEUP DETECTOR
8	PAUSE Ⓛ
9	
10	MEMORY COUNTER

C D E F G H

SERVO SCHEMATIC DIAGRAM



TP201 REC/SP Mode 0.5V/5msec. div.
TP202 P.B. Mode 2V/5msec. div.
TP203 (Up) REC/SP Mode 5V/10msec. div.
TP204 (Down) 2V/10msec. div.
TP204 (Down), TP205 (Up) REC/SP Mode 5V/10msec. div.
TP212 P.B. Mode 5V/2msec. div.
TP213 P.B./SP Mode 0.2V/1msec. div.
TP213 P.B./LP Mode 0.2V/1msec. div.
TP214 REC/SP Mode 0.2V/10msec. div.
TP214 P.B/SP Mode 2V/10msec. div.
TP215 P.B/LP Mode 10V/10msec. div.
TP216 2V/10msec. div.
TP201 (Up) REC/SP Mode, TP207 (Down) 1V/10msec. div. 2V/10msec. div.
TP207 2V/2msec. div.
TP208 P.B./LP Mode 1V/10msec. div.
TP208 P.B./SP Mode 1V/10msec. div.
P24-③, ④, ⑤ REC/SP Mode 20V/2msec. div.
TP210 P.B./SP Mode 0.5V/2msec. div.
Q229 2SC1684
Q230 2SC1684
Q201 2SC1327 INVERTER
IC201 AN6340
IC202 DN6811
IC203 AN6341
Q202 2SA564
Q203 2SC1684
Q204 2SA721
Q205 2SA564
Q206 2SC2497
Q207 2SA564 CYLINDER DRIVE
Q208 2SC2497
Q209 2SA564
Q210 2SC2497
Q211 2SC1684
Q212 2SA564A
Q213 2SD636
Q214 2SA564
Q215 2SC1684 INVERTER
Q216 2SC1327
Q217 2SC1684
Q218 2SA564
Q219 2SC1327
Q220 2SA721
Q221 2SA564
Q222 2SA564
Q223 2SC1684
Q224 2SA564
Q225 2SC1684 INVERTER
Q226 2SC1684
Q227 2SC1318 DC AMP
Q228 2SA699
PG. SHIFTER ADJ
REC SHIFTER ADJ
CYL. FREE RUN ADJ
TRACKING FIX ADJ
CAP. FREE RUN ADJ
OSC LEVEL ADJ
OSCILLATOR
PULSE SHAPER
PG PULSE AMP
1/8 LP/SP FREQUENCY COUNT DOWN (240Hz→30Hz)
PB LP/SP AUTO SWITCHING
LP/SP SWITCHING
REC/RB SWITCHING
P24
1 CYLINDER PG
2
3 MAIN COIL 3
4 MAIN COIL 2
5 MAIN COIL 1
6 MAIN COIL COM
7 POSITION COIL 3
8 POSITION COIL 2
9 POSITION COIL 1
10 POSITION COIL COM
11 GND
12 OSC
P23
1 GND
2 CONTROL HEAD
3 +12V
4 TRACKING CONTROL
5 TRACKING CONTROL
P22
1 +12V
2 30HZ PG
3 V SYNC
4 GND
5 60HZ OSC
6 REC +12V
7 PLAY +12V
8 UNREG +19V
9 UNLOADING COMPLETION Ⓛ
10 CYLINDER PROTECTION
P21
1 REC DELAY +12V
2 CAPSTAN FG
3 TRACKING (TP6303)
4 E-E/V-V SELECT
5 DELAYED REC
6 GND
7 LP/SP SW
8 LP Ⓗ
9 CAPSTAN MOTOR DRIVE
10 CAPSTAN +12V
JA
1 E-E/V-V SELECT
2 LP↔SP MUTING
3 LP Ⓗ
4 PLAY +12V
5 REC DELAY +12V
JB
1 +12V
2 REC +12V
3
4 GND
5 GND
A B C D E F G H
1 2 3 4 5 6

VOLTAGES ARE MEASURED IN THE RECORDING MODE, VOLTAGES IN THE BRACKETS( ) IN THE PLAY-BACK MODE.

PIN NO.	SIGNAL NAM
1	Rec. Delay +12
2	Capstan FG
3	Tracking (TP63
4	E-E/V-V Select
5	—
6	GND
7	LP/SP SW
8	LP Ⓗ
9	Capstan Motor
10	Capstan +12V

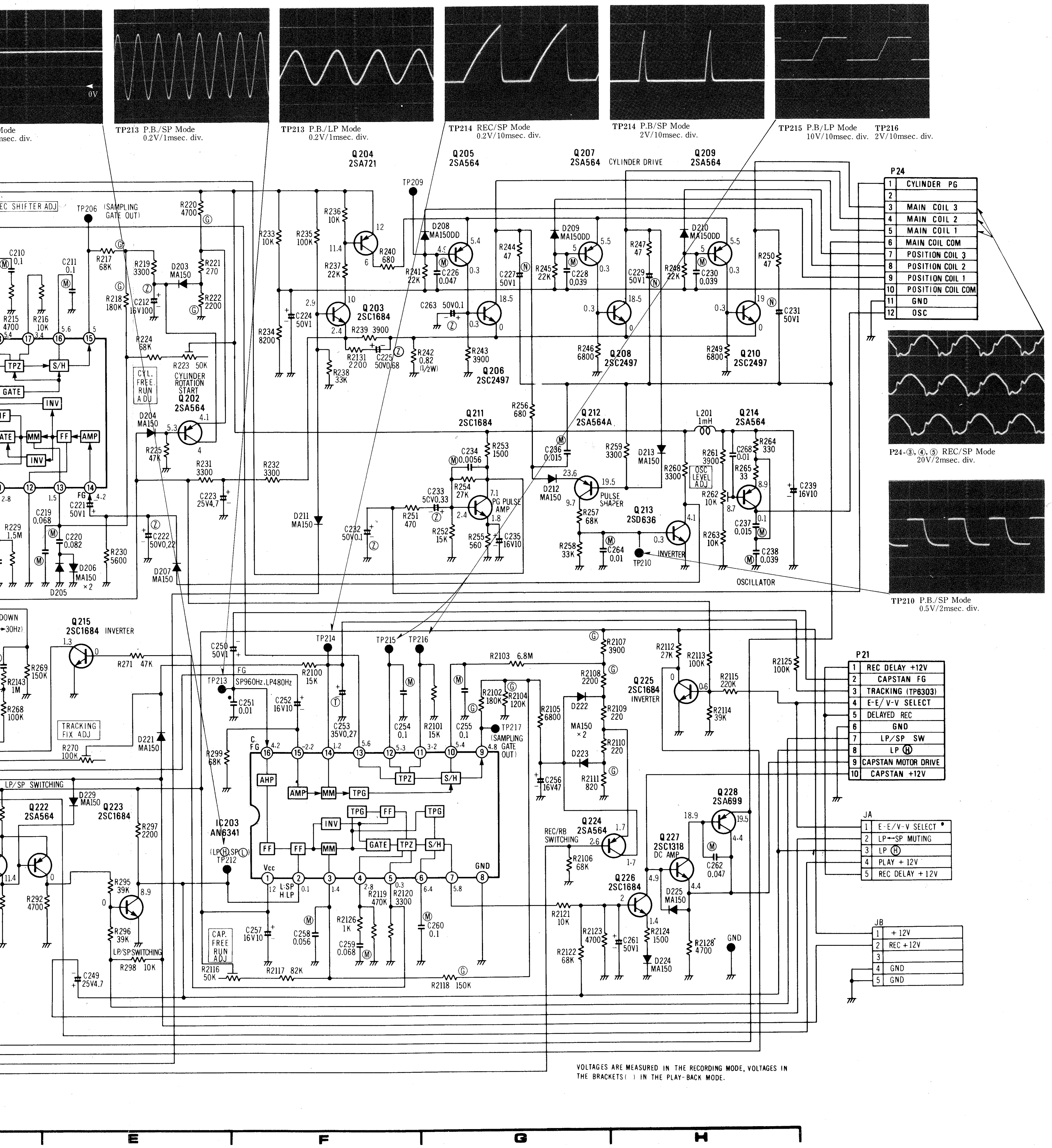
PIN NO.	SIGNAL NAM
1	+12V
2	30Hz PG
3	V. Sync.
4	GND
5	60Hz OSC
6	Rec. +12V
7	Play +12V
8	Unreg. +19V
9	Unloading Completi
10	Cylinder Protect

PIN NO.	SIGNAL NAM
1	GND
2	Control Head
3	+12V
4	Tracking Contro
5	Tracking Contro

PIN NO.	SIGNAL NAM
1	Cylinder PG
2	—
3	Main Coil 3
4	Main Coil 2
5	Main Coil 1
6	Main Coil Com
7	Position Coil 3
8	Position Coil 2
9	Position Coil 1
10	Position Coil Co
11	GND
12	OSC

PIN NO.	SIGNAL NAM
1	E-E/V-V Select
2	LP↔SP Muting
3	LP Ⓗ
4	Play +12V
5	Rec. Delay +12

PIN NO.	SIGNAL NAM
1	+12V
2	Rec. +12V
3	—
4	GND
5	GND


TP213 P.B./SP Mode 0.2V/1msec. div.
TP213 P.B./LP Mode 0.2V/1msec. div.
TP214 REC/SP Mode 0.2V/10msec. div.
TP214 P.B./SP Mode 2V/10msec. div.
TP215 P.B./LP Mode 10V/10msec. div.
TP216 2V/10msec. div.
P24-③, ④, ⑤ REC/SP Mode 20V/2msec. div.
TP210 P.B./SP Mode 0.5V/2msec. div.
Q204 2SA721
Q205 2SA564
Q207 2SA564 CYLINDER DRIVE
Q209 2SA564
Q203 2SC1684
Q206 2SC2497
Q208 2SC2497
Q210 2SC2497
Q202 2SA564
Q211 2SC1684
Q212 2SA564A
Q213 2SD636 INVERTER
Q214 2SA564 OSCILLATOR
Q215 2SC1684 INVERTER
Q222 2SA564
Q223 2SC1684
Q224 2SA564 REC/PB SWITCHING
Q225 2SC1684 INVERTER
Q226 2SC1684
Q227 2SC1318 DC AMP
Q228 2SA699
IC203 AN6341
P24
CYLINDER PG
MAIN COIL 3
MAIN COIL 2
MAIN COIL 1
MAIN COIL COM
POSITION COIL 3
POSITION COIL 2
POSITION COIL 1
POSITION COIL COM
GND
OSC
P21
REC DELAY +12V
CAPSTAN FG
TRACKING (TP6303)
E-E/V-V SELECT
DELAYED REC
GND
LP/SP SW
LP Ⓗ
CAPSTAN MOTOR DRIVE
CAPSTAN +12V
JA
E-E/V-V SELECT
LP↔SP MUTING
LP Ⓗ
PLAY +12V
REC DELAY +12V
JB
+12V
REC +12V
GND
GND
CYL. FREE RUN ADJ
CYLINDER ROTATION START
TRACKING FIX ADJ
CAP. FREE RUN ADJ
OSC LEVEL ADJ
PG PULSE AMP
PULSE SHAPER
SAMPLING GATE OUT
LP/SP SWITCHING
E
F
G
H

VOLTAGES ARE MEASURED IN THE RECORDING MODE, VOLTAGES IN THE BRACKETS( ) IN THE PLAY-BACK MODE.

P21 (Servo C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	Rec. Delay +12V	P32-8 (Luminance Process)
2	Capstan FG	P605-1 (Capstan Motor)
3	Tracking (TP6303)	P622-3 (RF Envelope TP's)
4	E-E/V-V Select	P32-10 (Luminance Process)
5	—	—
6	GND	P32-7 (Luminance Process)
7	LP/SP SW	P620-1 (LP/SP SW)
8	LPⒽ	P31-3 (Luminance)
9	Capstan Motor Drive	P605-2 (Capstan Motor)
10	Capstan +12V	P65-3 (Reg. & Transport)

P22 (Servo C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	+12V	P62-9 (Reg. & Transport)
2	30Hz PG	P32-5 (Luminance Process)
3	V. Sync.	P32-3 (Luminance Process)
4	GND	P65-6 (Reg. & Transport)
5	60Hz OSC	P32-2 (Luminance Process)
6	Rec. +12V	P32-9 (Luminance Process)
7	Play +12V	P65-5 (Reg. & Transport)
8	Unreg. +19V	P65-1 (Reg. & Transport)
9	Unloading Completion Ⓛ	P63-2 (Reg. & Transport)
10	Cylinder Protection	P65-2 (Reg. & Transport)

P23 (Servo C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	GND	P612-4 (Audio/Control Head Connection)
2	Control Head	P612-5 (Audio/Control Head Connection)
3	+12V	P614-3 (Reel Sensor)
4	Tracking Control	P620-2 (LP/SP Select SW)
5	Tracking Control	P620-3 (LP/SP Select SW)

P24 (Servo C.B.A.)

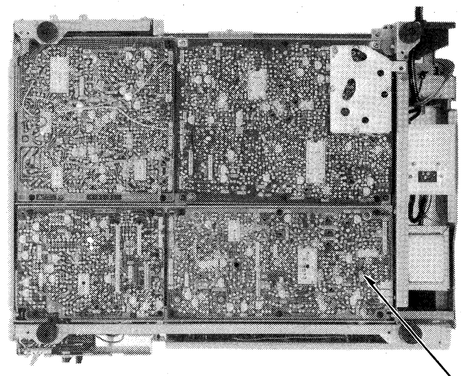
PIN NO.	SIGNAL NAME	DESTINATION
1	Cylinder PG	H6305 (PG Head)
2	—	—
3	Main Coil 3	Cylinder Motor
4	Main Coil 2	
5	Main Coil 1	
6	Main Coil Com	
7	Position Coil 3	
8	Position Coil 2	
9	Position Coil 1	
10	Position Coil Com	
11	GND	
12	OSC	

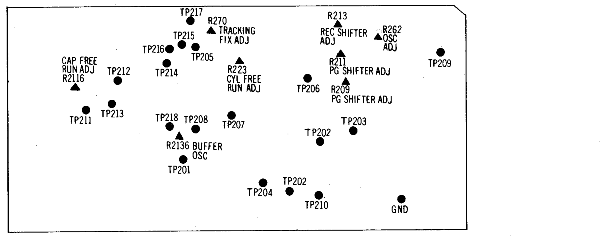
JA (Servo C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	E-E/V-V Select	J1-1 (Audio)
2	LP↔SP Muting	J1-2 (Audio)
3	LPⒽ	J1-3 (Audio)
4	Play +12V	J1-4 (Audio)
5	Rec. Delay +12V	J1-5 (Audio)

JB (Servo C.B.A.)

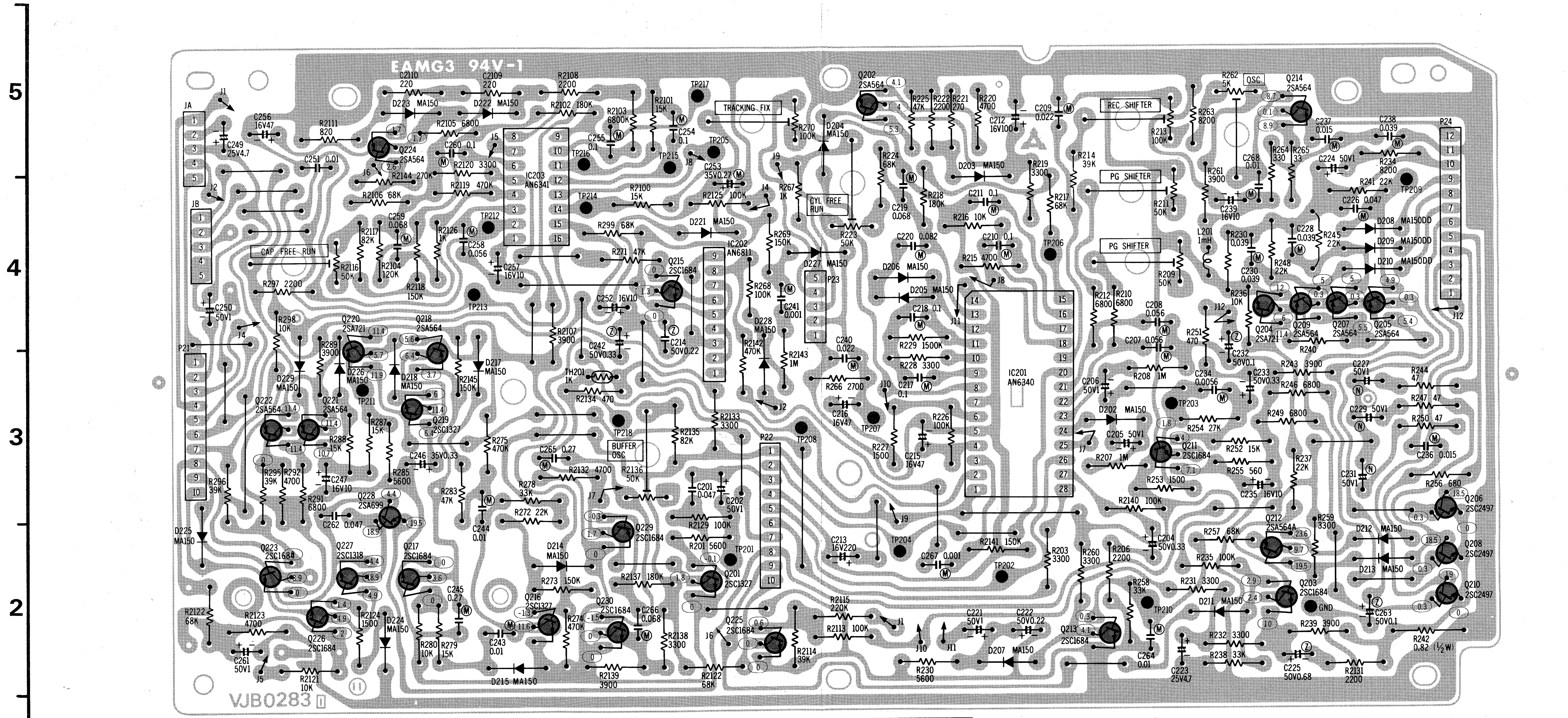
PIN NO.	SIGNAL NAME	DESTINATION
1	+12V	J2-1 (Audio)
2	Rec. +12V	J2-2 (Audio)
3	—	—
4	GND	J2-4 (Audio)
5	GND	J2-5 (Audio)


Servo C.B.A. (VEP0283B)


TP217
R270 TRACKING FIX ADJ
R213 REC SHIFTER ADJ
R262 OSC ADJ
TP215
TP216
TP205
TP209
CAP FREE RUN ADJ R2116
TP212
TP214
R223 CYL FREE RUN ADJ
R211 PG SHIFTER ADJ
TP206
R203 PG SHIFTER ADJ
TP211
TP213
TP218
TP208
TP207
TP203
TP202
R2136 BUFFER OSC
TP201
TP202
TP204
TP210
GND

Servo Circuit	
Q201	C-2
Q202	D-5
Q203	F-2
Q204	F-4
Q205	F-4
Q206	G-3
Q207	F-4
Q208	G-2
Q209	F-4
Q210	G-2
Q211	E-3
Q212	F-2
Q213	E-2
Q214	F-5
Q215	C-4
Q216	C-2
Q217	B-2
Q218	B-3
Q219	B-3
Q220	B-3
Q221	B-3
Q222	B-3
Q223	B-2
Q224	B-5
Q225	D-2
Q226	B-2
Q227	B-2
Q228	B-3
Q229	C-2
Q230	C-2

SERVO CIRCUIT BOARD (VEP0283B)


5
4
3
2
1
A
B
C
D
E
F
G
EAMG3 94V-1
VJB0283
IC201 AN6340
IC202 AN6811
IC203 AN6341
TRACKING FIX
CYL FREE RUN
CAP FREE RUN
REC SHIFTER
PG SHIFTER
PG SHIFTER
BUFFER OSC
OSC
JA
JB
J12
P21
P22
P23
P24
GND

P21

1	REC DELAY +12V
2	CAPSTAN FG
3	TRACKING (TP6303)
4	E-E/V-V SELECT
5	
6	GND
7	LP/SP SW
8	LPⒽ
9	CAPSTAN MOTOR DRIVE
10	CAPSTAN +12V

P22

1	+12V
2	30Hz PG
3	V SYNC
4	GND
5	60Hz OSC
6	REC +12V
7	PLAY +12V
8	UNREG +19V
9	UNLOADING COMPLETIONⓁ
10	CYLINDER PROTECTION

P23

1	GND
2	CONTROL HEAD
3	+12V
4	TRACKING CONTROL
5	TRACKING CONTROL

P24

1	CYLINDER PG
2	
3	MAIN COIL 3
4	MAIN COIL 2
5	MAIN COIL 1
6	MAIN COIL COM
7	POSITION COIL 3
8	POSITION COIL 2
9	POSITION COIL 1
10	POSITION COIL COM
11	GND
12	OSC

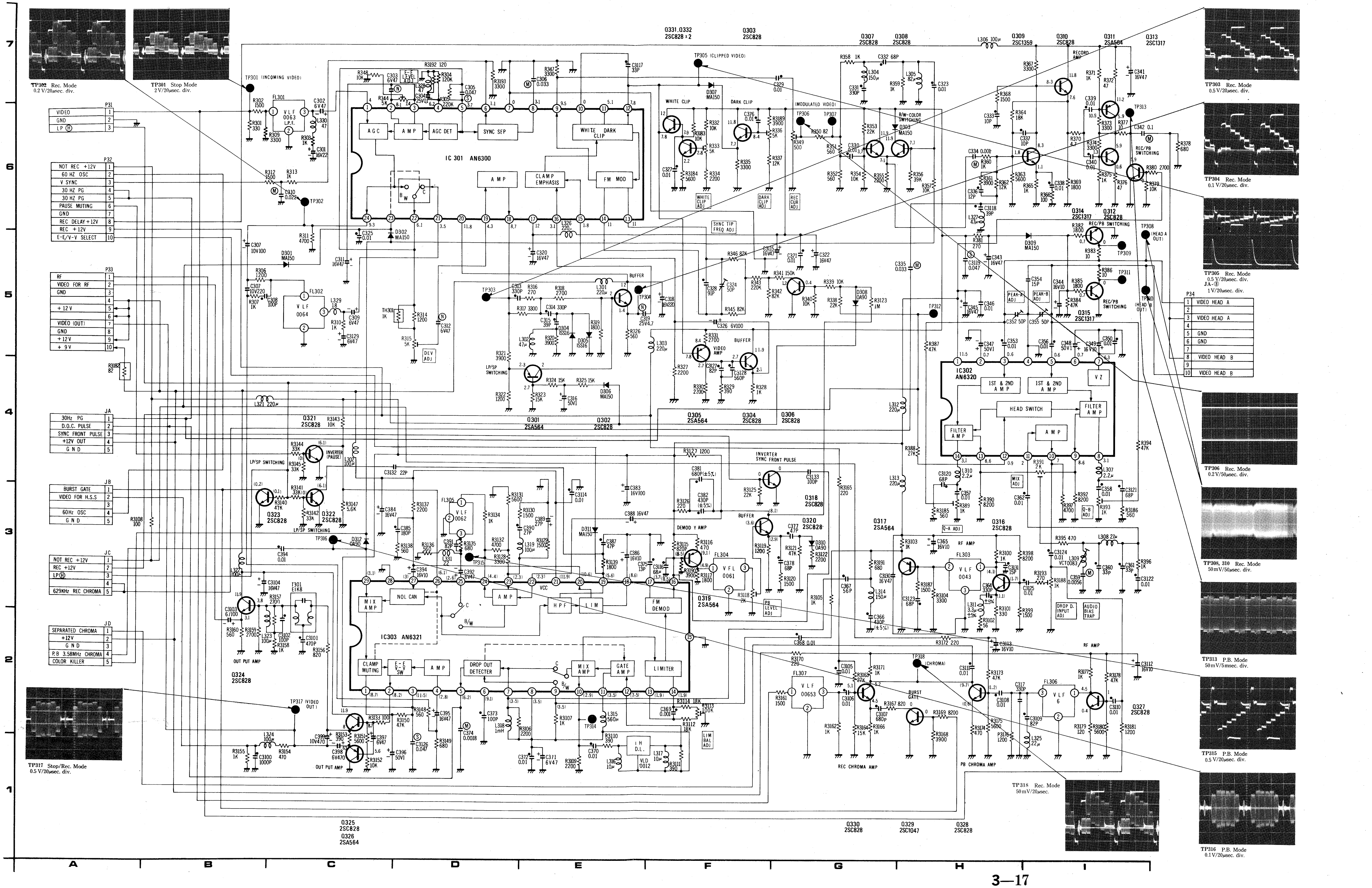
JA

1	E-E/V-V SELECT
2	LP↔SP MUTING
3	LPⒽ
4	PLAY +12V
5	REC DELAY +12V

JB

1	+12V
2	REC +12V
3	
4	GND
5	GND

LUMINANCE PROCESS SCHEMATIC DIAGRAM


IC 301 AN6300
AGC
AMP
AGC DET
SYNC SEP
WHITE DARK CLIP
CLAMP EMPHASIS
FM MOD
IC302 AN6320
1ST & 2ND AMP
HEAD SWITCH
FILTER AMP
VZ
IC303 AN6321
MIX AMP
NOL CAN
HPF
LIM
FM DEMOD
CLAMP MUTING
E-E V-V SW
DROP OUT DETECTER
MIX AMP
GATE AMP
LIMITER
P31
VIDEO
GND
LP Ⓗ
P32
NOT REC +12V
60 HZ OSC
V SYNC
30 HZ PG
30 HZ PG
PAUSE MUTING
GND
REC DELAY +12V
REC +12V
E-E/V-V SELECT
P33
RF
VIDEO FOR RF
GND
+12 V
VIDEO (OUT)
GND
+12V
+ 9V
JA
30Hz PG
D.O.C. PULSE
SYNC FRONT PULSE
+12V OUT
G N D
JB
BURST GATE
VIDEO FOR H.S.S
60Hz OSC
G N D
JC
NOT REC +12V
REC +12V
LP Ⓗ
629KHz REC CHROMA
JD
SEPARATED CHROMA
+12V
G N D
P.B 3.58MHz CHROMA
COLOR KILLER
P34
VIDEO HEAD A
VIDEO HEAD A
GND
GND
VIDEO HEAD B
VIDEO HEAD B
TP301 (INCOMING VIDEO)
TP305 (CLIPPED VIDEO)
TP306 (MODULATED VIDEO)
TP317 (VIDEO OUT)
TP318 (CHROMA)
TP308 (HEAD A OUT)
TP310 (HEAD B OUT)
Q331.Q332 2SC828 ×2
Q303 2SC828
Q307 2SC828
Q308 2SC828
Q309 2SC1359
Q310 2SC828
Q311 2SA564
Q313 2SC1317
Q314 2SC1317
Q312 2SC828
Q315 2SC1317
Q301 2SA564
Q302 2SC828
Q305 2SA564
Q304 2SC828
Q306 2SC828
Q321 2SC828
Q323 2SC828
Q322 2SC828
Q318 2SC828
Q320 2SC828
Q319 2SA564
Q317 2SA564
Q316 2SC828
Q324 2SC828
Q325 2SC828
Q326 2SA564
Q330 2SC828
Q329 2SC1047
Q328 2SC828
Q327 2SC828
WHITE CLIP
DARK CLIP
B/W-COLOR SWITCHING
RECORD AMP
REC/PB SWITCHING
BUFFER
VIDEO AMP
LP/SP SWITCHING
INVERTER (PAUSE)
INVERTER SYNC FRONT PULSE
DEMOD Y AMP
OUT PUT AMP
RF AMP
REC CHROMA AMP
PB CHROMA AMP
BURST GATE
A
B
C
D
E
F
G
H
I
1
2
3
4
5
6
7

TP302 Rec. Mode
0.2 V/20μsec. div.

TP301 Stop Mode
2 V/20μsec. div.

TP317 Stop/Rec. Mode
0.5 V/20μsec. div.

TP318 Rec. Mode
50mV/20μsec.

TP303 Rec. Mode
0.5 V/20μsec. div.

TP304 Rec. Mode
0.1 V/20μsec. div.

TP305 Rec. Mode
0.5 V/20μsec. div.
JA-③
1 V/20μsec. div.

TP306 Rec. Mode
0.2 V/50μsec. div.

TP308, 310 Rec. Mode
50mV/50μsec. div.

TP313 P.B. Mode
50mV/5msec. div.

TP315 P.B. Mode
0.5 V/20μsec. div.

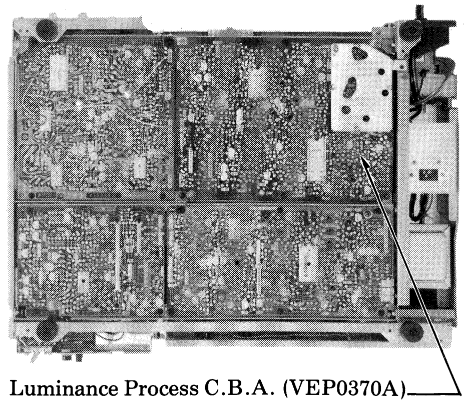
TP316 P.B. Mode
0.1V/20μsec. div.

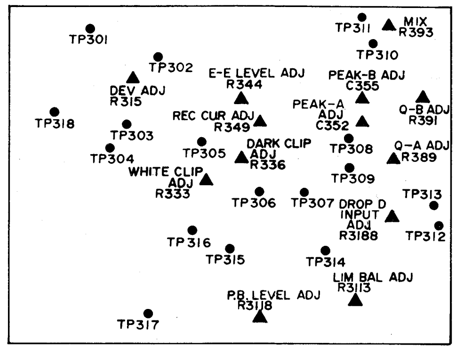
P31 (Luminance Process C.B.A.)		
PIN NO.	SIGNAL NAME	DESTINATION
1	Video	P603-4 (TV/Camera Input Selector)
2	GND	P603-3 (TV/Camera Input Selector)
3	LPⒽ	P21-8 (Servo)

P32 (Luminance Process C.B.A.)		
PIN NO.	SIGNAL NAME	DESTINATION
1	Not Rec. +12V	P43-9 (Audio)
2	60Hz OSC	P22-5 (Servo)
3	V. Sync.	P22-3 (Servo)
4	30Hz PG (TP6305)	P622-2 (RF Envelope TP's)
5	30Hz PG	P22-2 (Servo)
6	Pause Muting	P44-3 (Audio)
7	GND	P21-6 (Servo)
8	Rec. Delay +12V	P21-1 (Servo)
9	Rec. +12V	P22-6 (Servo)
10	E-E/V-V Select	P21-4 (Servo)

P33 (Luminance Process C.B.A.)		
PIN NO.	SIGNAL NAME	DESTINATION
1	RF (TP6304)	P622-1 (RF Envelope TP's)
2	Video for RF	P611-3 (RF Converter Connection)
3	GND	P611-2 (RF Converter Connection)
4	+12V	—
5	+12V	P62-10 (Reg. & Transport)
6	—	—
7	Video (Out)	P601-10 (Rear Jack)
8	GND	P601-9 (Rear Jack)
9	+12V	P703-1 (TV Demodulator)
10	+9V	P611-5 (RF Converter Connection)

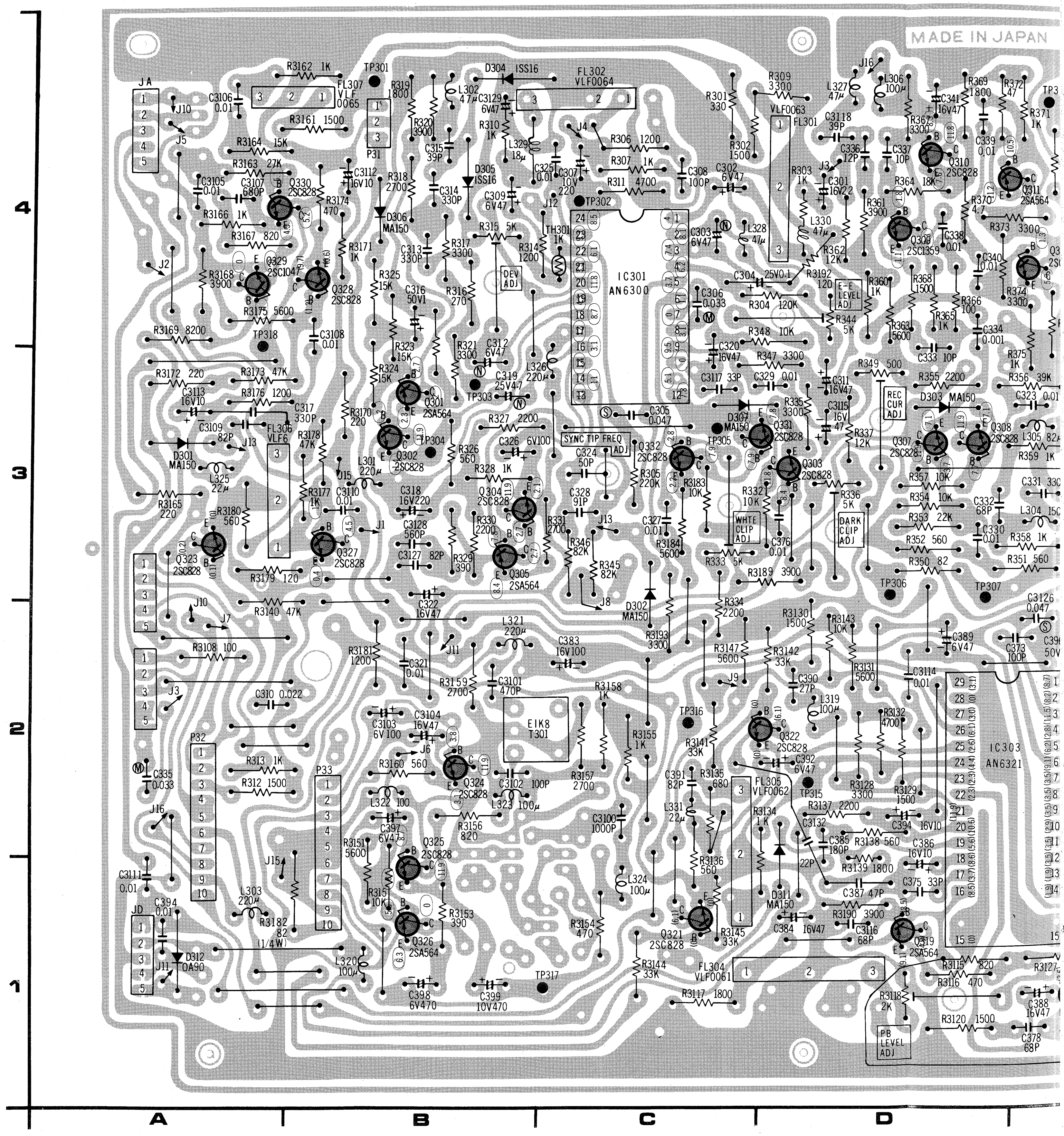
P34 (Luminance Process C.B.A.)		
PIN NO.	SIGNAL NAME	DESTINATION
1	Video Head-A	H6301 (Video Head)
2	—	—
3	Video Head-A	H6301 (Video Head)
4	—	—
5	GND	H6301 (Video Head)
6	GND	H6302 (Video Head)
7	—	—
8	Video Head-B	H6302 (Video Head)
9	—	—
10	Video Head-B	H6302 (Video Head)

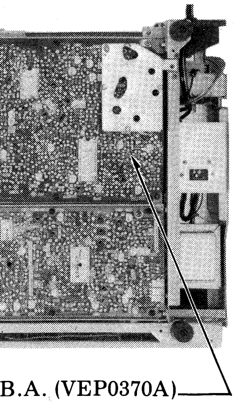

Luminance Process C.B.A. (VEP0370A)

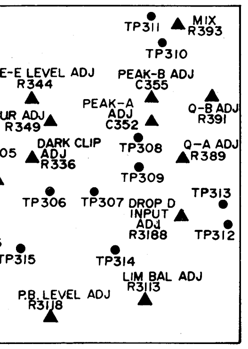

TP301
TP302
DEV ADJ
R315
TP318
TP303
TP304
E-E LEVEL ADJ
R344
REC CUR ADJ
R349
TP305
DARK CLIP
ADJ
R336
WHITE CLIP
ADJ
R333
TP306
TP307
TP311
MIX
R393
TP310
PEAK-B ADJ
C355
PEAK-A
ADJ
C352
Q-B ADJ
R391
TP308
Q-A ADJ
R389
TP309
TP313
DROP D
INPUT
ADJ
R3188
TP312
TP316
TP315
TP314
LIM BAL ADJ
R3113
P.B. LEVEL ADJ
R3118
TP317

Luminance Process Circuit	
Q301	B-3
Q302	B-3
Q303	C-3
Q304	B-3
Q305	B-3
Q306	F-1
Q307	D-3
Q308	D-3
Q309	D-4
Q310	D-4
Q311	D-4
Q312	D-4
Q313	E-4
Q314	E-3
Q315	E-4
Q316	F-2
Q317	E-2
Q318	F-1
Q319	D-1
Q320	E-1
Q321	C-1
Q322	C-2
Q323	A-3
Q324	B-2
Q325	B-1
Q326	B-1
Q327	B-3
Q328	B-4
Q329	A-4
Q330	A-4
Q331	C-3
Q332	C-3
IC301	C-4
IC302	E-4
IC303	D-2

LUMINANCE PROCESS CIRCUIT BOARD (VEP0370A)

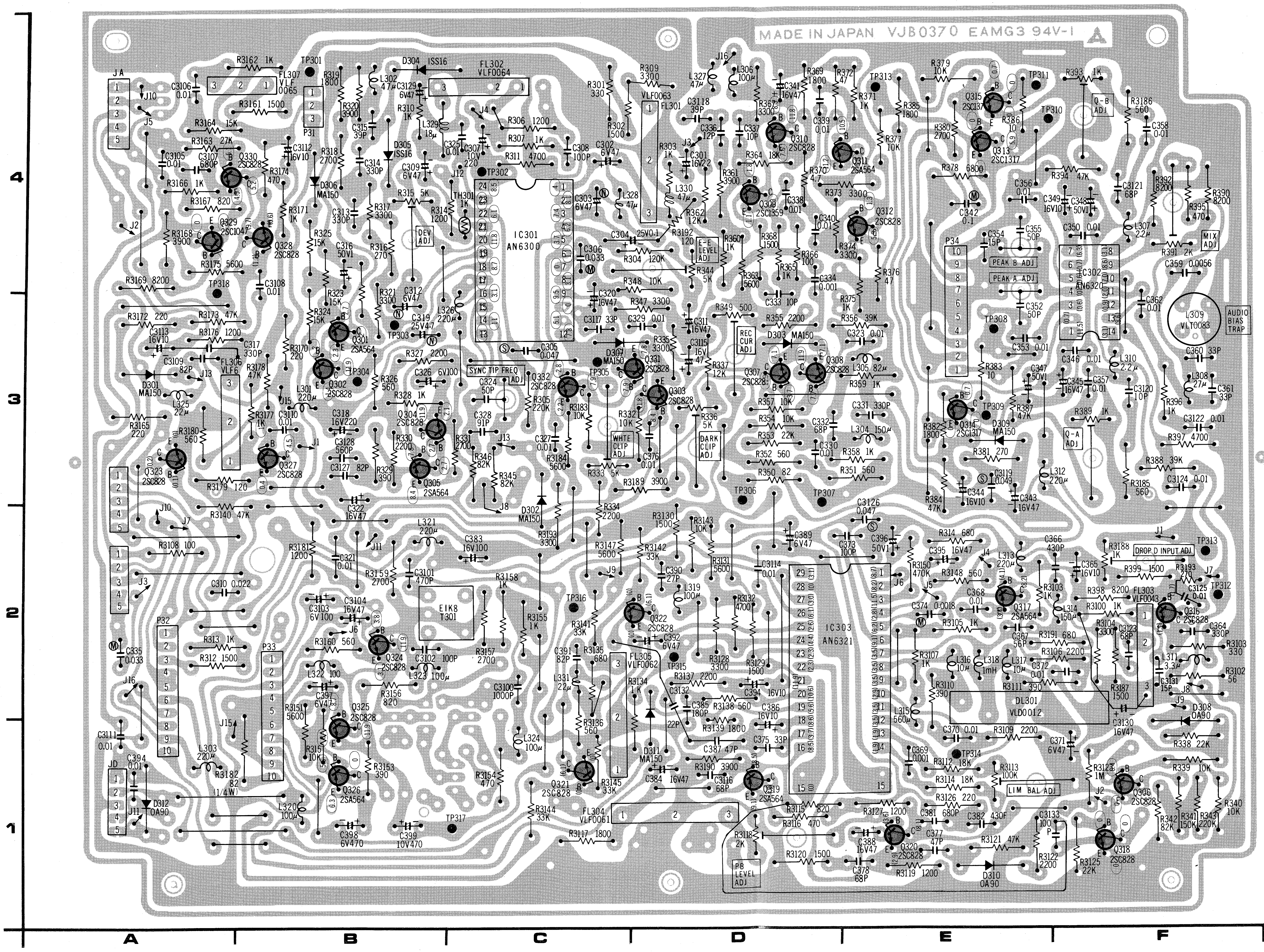

MADE IN JAPAN
IC301
AN6300
IC303
AN6321
SYNC TIP FREQ ADJ
DEV ADJ
E-E LEVEL ADJ
REC CUR ADJ
WHITE CLIP ADJ
DARK CLIP ADJ
PB LEVEL ADJ
4
3
2
1
A
B
C
D


B.A. (VEP0370A)


TP311
MIX R393
TP310
E-E LEVEL ADJ R344
PEAK-B ADJ C355
PEAK-A ADJ C352
UR ADJ R349
Q-B ADJ R391
DARK CLIP ADJ R336
TP308
Q-A ADJ R389
TP309
TP306
TP307
DROP D INPUT ADJ R3188
TP313
TP312
TP315
TP314
LIM BAL ADJ R3113
P.B. LEVEL ADJ R3118

ce Process
B-3
B-3
C-3
B-3
B-3
F-1
D-3
D-3
D-4
D-4
D-4
D-4
E-4
E-3
E-4
F-2
E-2
F-1
D-1
E-1
C-1
C-2
A-3
B-2
B-1
B-1
B-3
B-4
A-4
A-4
C-3
C-3
C-4
E-4
D-2

LUMINANCE PROCESS CIRCUIT BOARD (VEP0370A)


MADE IN JAPAN VJB0370 EAMG3 94V-1
4
3
2
1
A
B
C
D
E
F
JA
JB
JC
JD
P31
P32
P33
P34
IC301 AN6300
IC302 AN6320
IC303 AN6321
FL301
FL302 VLF0064
FL303 VLF0043
FL304 VLF0061
FL305 VLF0062
FL306 VLF6
FL307 VLF0065
DL301 VLD0012
T301 EIK8
L309 VLT0083
AUDIO BIAS TRAP
DEV ADJ
SYNC TIP FREQ ADJ
WHITE CLIP ADJ
DARK CLIP ADJ
E-E LEVEL ADJ
REC CUR ADJ
PEAK B ADJ
PEAK A ADJ
Q-B ADJ
Q-A ADJ
MIX ADJ
DROP D INPUT ADJ
LIM BAL ADJ
PB LEVEL ADJ
TP301
TP302
TP303
TP304
TP305
TP306
TP307
TP308
TP309
TP310
TP311
TP312
TP313
TP314
TP315
TP316
TP317
TP318

P31	
1	VIDEO
2	GND
3	LPⒽ

P32	
1	NOT REC +12V
2	60Hz OSC
3	V SYNC
4	30Hz PG (TP6305)
5	30Hz PG
6	PAUSE MUTING
7	GND
8	REC DELAY +12V
9	REC +12V
10	E-E/V-V SELECT

P33	
1	RF (TP6304)
2	VIDEO FOR RF
3	GND
4	+12V
5	+12V
6	
7	←VIDEO (OUT)
8	GND
9	+12V
10	+12V

P34	
1	VIDEO HEAD A
2	
3	VIDEO HEAD A
4	
5	GND
6	GND
7	
8	VIDEO HEAD B
9	
10	VIDEO HEAD B

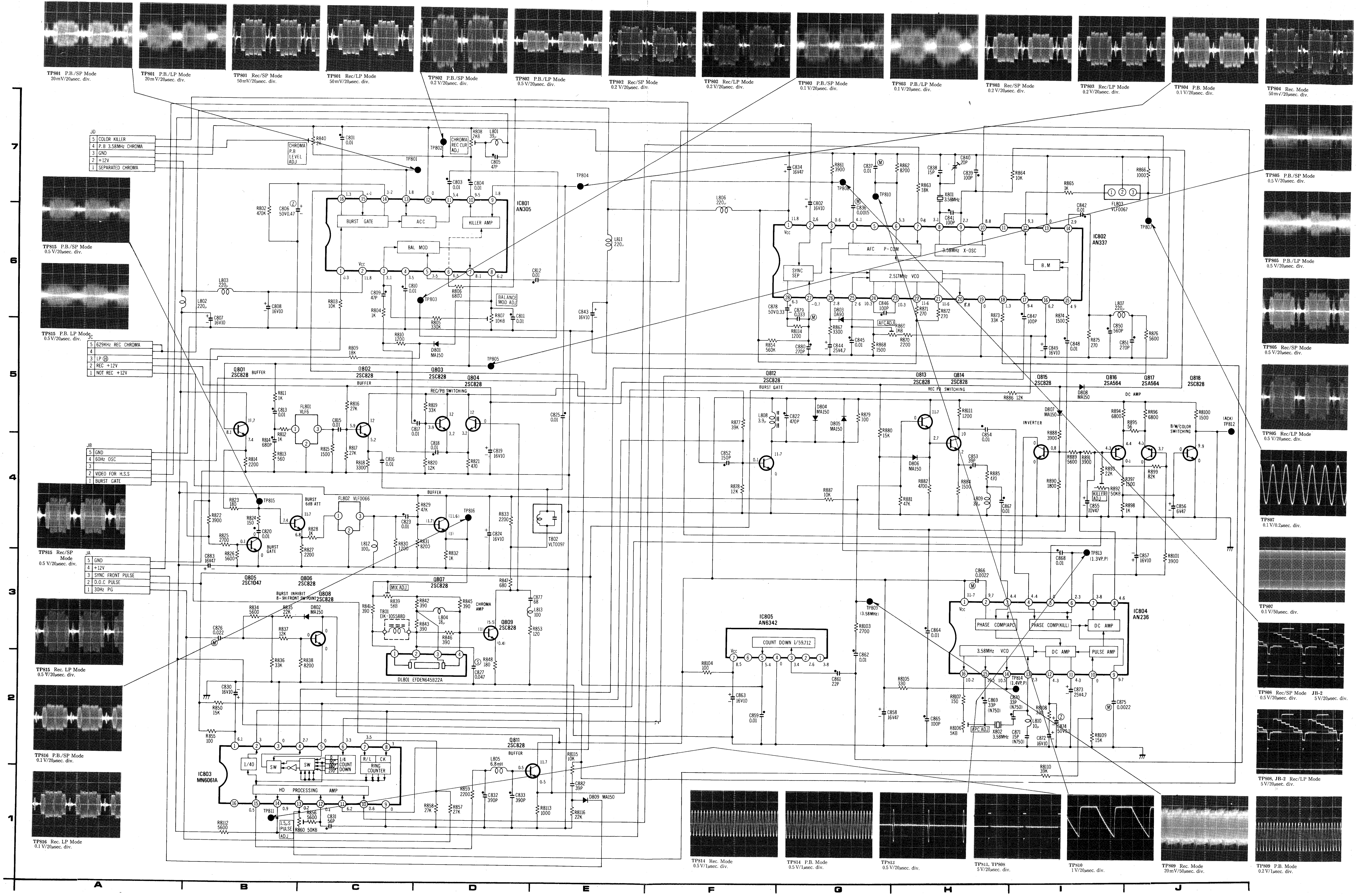
JA	
1	30Hz PG
2	D.O.C. PULSE
3	SYNC FRONT PULSE
4	+12V
5	GND

JB	
1	BURST GATE
2	VIDEO FOR H.S.S
3	
4	60Hz OSC
5	GND

JC	
1	NOT REC +12V
2	REC +12V
3	LPⒽ
4	
5	629KHz REC CHROMA

JD	
1	SEPARATED CHROMA
2	+12V
3	GND
4	P.B 3.58MHz CHROMA
5	COLOR KILLER

CHROMINANCE PROCESS SCHEMATIC DIAGRAM


TP801 P.B./SP Mode 20mV/20μsec. div.
TP801 P.B./LP Mode 20mV/20μsec. div.
TP801 Rec/SP Mode 50mV/20μsec. div.
TP801 Rec/LP Mode 50mV/20μsec. div.
TP802 P.B./SP Mode 0.2 V/20μsec. div.
TP802 P.B./LP Mode 0.5 V/20μsec. div.
TP802 Rec/SP Mode 0.2 V/20μsec. div.
TP802 Rec/LP Mode 0.2 V/20μsec. div.
TP803 P.B./SP Mode 0.1 V/20μsec. div.
TP803 P.B./LP Mode 0.1 V/20μsec. div.
TP803 Rec/SP Mode 0.2 V/20μsec. div.
TP803 Rec/LP Mode 0.2 V/20μsec. div.
TP804 P.B. Mode 0.1 V/20μsec. div.
TP804 Rec. Mode 50mV/20μsec. div.
TP805 P.B./SP Mode 0.5 V/20μsec. div.
TP805 P.B./LP Mode 0.5 V/20μsec. div.
TP805 Rec/SP Mode 0.5 V/20μsec. div.
TP805 Rec/LP Mode 0.5 V/20μsec. div.
TP807 0.1 V/0.2μsec. div.
TP807 0.1 V/50μsec. div.
TP808 Rec/SP Mode 0.5 V/20μsec. div. JB-2 5 V/20μsec. div.
TP808, JB-2 Rec/LP Mode 5 V/20μsec. div.
TP809 P.B. Mode 0.2 V/1μsec. div.
TP809 Rec. Mode 20mV/50μsec. div.
TP810 1 V/20μsec. div.
TP811, TP808 5 V/20μsec. div.
TP813 0.5 V/20μsec. div.
TP814 P.B. Mode 0.5 V/1μsec. div.
TP814 Rec. Mode 0.5 V/1μsec. div.
TP815 P.B./SP Mode 0.5 V/20μsec. div.
TP815 P.B. LP Mode 0.5 V/20μsec. div.
TP815 Rec/SP Mode 0.5 V/20μsec. div.
TP815 Rec. LP Mode 0.5 V/20μsec. div.
TP816 P.B./SP Mode 0.1 V/20μsec. div.
TP816 Rec. LP Mode 0.1 V/20μsec. div.
JD
5 COLOR KILLER
4 P.B 3.58MHz CHROMA
3 GND
2 +12V
1 SEPARATED CHROMA
JC
5 629KHz REC CHROMA
4
3 LP Ⓗ
2 REC +12V
1 NOT REC +12V
JB
5 GND
4 60Hz OSC
3
2 VIDEO FOR H.S.S
1 BURST GATE
JA
5 GND
4 +12V
3 SYNC FRONT PULSE
2 D.O.C PULSE
1 30Hz PG
IC801 AN305
BURST GATE
ACC
KILLER AMP
BAL MOD
CHROMA P.B LEVEL ADJ
CHROMA REC CUR ADJ
BALANCE MOD ADJ
IC802 AN337
SYNC SEP
AFC P-COM
3.58MHz X-OSC
2.517MHz VCO
B.M
AFC ADJ
FL803 VLF0067
X801 3.58MHz
IC803 MN6061A
1/40
SW
1/4 COUNT DOWN
R/L CK RING COUNTER
HD PROCESSING AMP
L.S.S PULSE ADJ
IC804 AN236
PHASE COMP(APC)
PHASE COMP(KILL)
DC AMP
3.58MHz VCO
PULSE AMP
APC ADJ
X802 3.58MHz
IC805 AN6342
COUNT DOWN 1/59.712
Q801 2SC828 BUFFER
Q802 2SC828 BUFFER
Q803 2SC828
Q804 2SC828 REC/PB SWITCHING
Q805 2SC1047 BURST GATE
Q806 2SC828 BURST 6dB ATT
Q807 2SC828 BUFFER
Q808 2SC828 BURST INHIBIT 8~9H FRONT SW POINT
Q809 2SC828 CHROMA AMP
Q811 2SC828 BUFFER
Q812 2SC828 BURST GATE
Q813 2SC828
Q814 2SC828 REC PB SWITCHING
Q815 2SC828 INVERTER
Q816 2SA564 DC AMP
Q817 2SA564
Q818 2SC828 B/W/COLOR SWITCHING
KILLER ADJ
MIX ADJ
FL801 VLF6
FL802 VLF0066
T801 EIK-10S588D
T802 VLT0097
DL801 EFDEN645822A
(ACK) TP812
TP813 (1.3VP.P)
TP814 (1.4VP.P)
TP809 (3.58MHz)
A
B
C
D
E
F
G
H
I
J
1
2
3
4
5
6
7

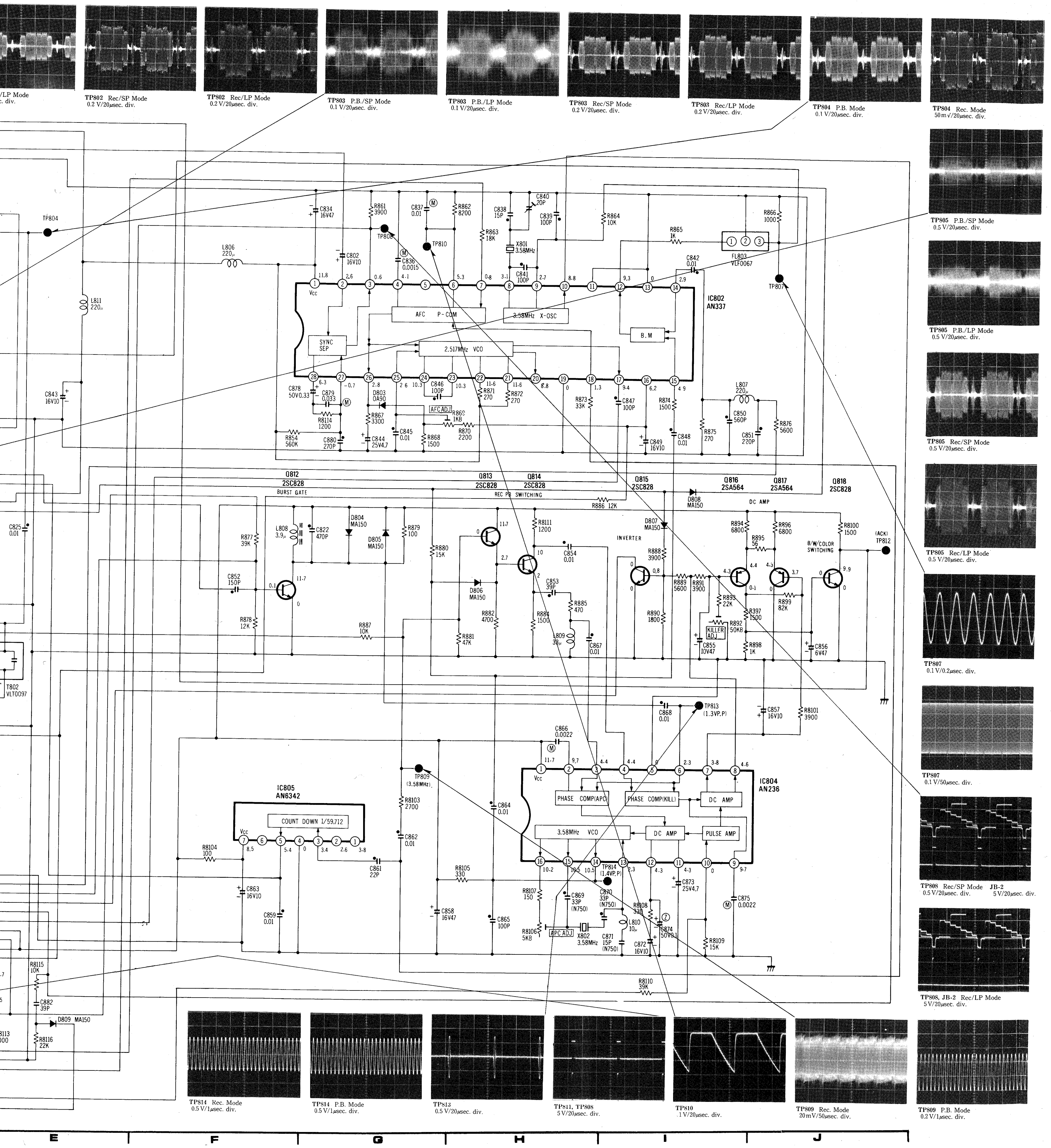
JA (Chrominar	
PIN NO.	SIGN
1	30 Hz P
2	D.O.C. P
3	Sync. Fr
4	+12 V
5	GND

JB (Chrominar	
PIN NO.	SIGN
1	Burst Ga
2	Video fo
3	—
4	60 Hz O
5	GND

JC (Chrominar	
PIN NO.	SIGN
1	Not Rec.
2	Rec. +1
3	LP Ⓗ
4	—
5	629 kHz

JD (Chrominar	
PIN NO.	SIGN
1	Separate
2	+12 V
3	GND
4	P.B. 3.5
5	Color Kil

DIAGRAM


/LP Mode
TP802 Rec/SP Mode
0.2 V/20μsec. div.
TP802 Rec/LP Mode
0.2 V/20μsec. div.
TP803 P.B./SP Mode
0.1 V/20μsec. div.
TP803 P.B./LP Mode
0.1 V/20μsec. div.
TP803 Rec/SP Mode
0.2 V/20μsec. div.
TP803 Rec/LP Mode
0.2 V/20μsec. div.
TP804 P.B. Mode
0.1 V/20μsec. div.
TP804 Rec. Mode
50mV/20μsec. div.
TP805 P.B./SP Mode
0.5 V/20μsec. div.
TP805 P.B./LP Mode
0.5 V/20μsec. div.
TP805 Rec/SP Mode
0.5 V/20μsec. div.
TP805 Rec/LP Mode
0.5 V/20μsec. div.
TP807
0.1 V/0.2μsec. div.
TP807
0.1 V/50μsec. div.
TP808 Rec/SP Mode JB-2
0.5 V/20μsec. div. 5 V/20μsec. div.
TP808, JB-2 Rec/LP Mode
5 V/20μsec. div.
TP814 Rec. Mode
0.5 V/1μsec. div.
TP814 P.B. Mode
0.5 V/1μsec. div.
TP813
0.5 V/20μsec. div.
TP811, TP808
5 V/20μsec. div.
TP810
1 V/20μsec. div.
TP809 Rec. Mode
20mV/50μsec. div.
TP809 P.B. Mode
0.2 V/1μsec. div.
IC802
AN337
AFC
P-COM
3.58MHz X-OSC
SYNC SEP
2.517MHz VCO
B.M
X801 3.58MHz
FL803 VLF0067
Q812 2SC828
BURST GATE
Q813 2SC828
Q814 2SC828
REC PB SWITCHING
Q815 2SC828
Q816 2SA564
Q817 2SA564
Q818 2SC828
DC AMP
INVERTER
B/W/COLOR SWITCHING
(ACK) TP812
KILLER ADJ
AFC ADJ
IC805
AN6342
COUNT DOWN 1/59712
IC804
AN236
PHASE COMP(APC)
PHASE COMP(KILL)
DC AMP
3.58MHz VCO
PULSE AMP
APC ADJ
X802 3.58MHz
TP813 (1.3VP.P)
TP809 (3.58MHz)
TP814 (1.4VP.P)
D809 MA150
E
F
G
H
I
J

JA (Chrominance Process C.B.A. ↔ Luminance Process C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	30Hz PG	JA-1 (Luminance)
2	D.O.C. Pulse	JA-2 (Luminance)
3	Sync. Front Pulse	JA-3 (Luminance)
4	+12V	JA-4 (Luminance)
5	GND	JA-5 (Luminance)

JB (Chrominance Process C.B.A. ↔ Luminance Process C.B.A.)

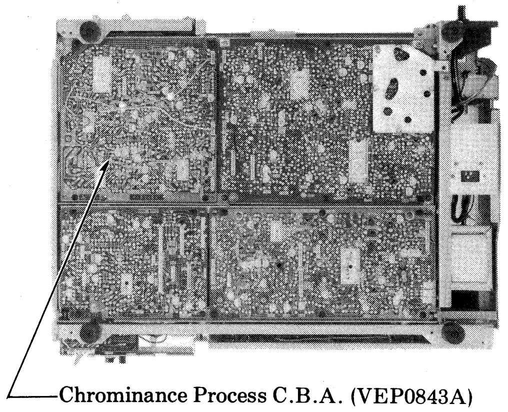
PIN NO.	SIGNAL NAME	DESTINATION
1	Burst Gate	JB-1 (Luminance)
2	Video for H.S.S.	JB-2 (Luminance)
3	—	—
4	60Hz OSC	JB-4 (Luminance)
5	GND	JB-5 (Luminance)

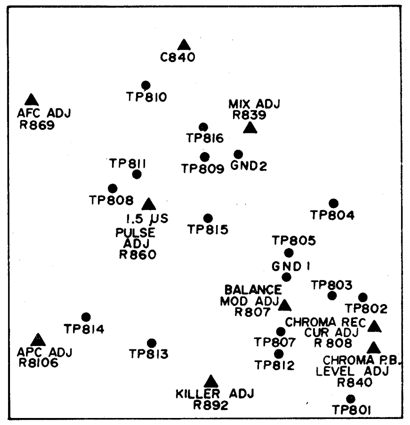
JC (Chrominance Process C.B.A. ↔ Luminance Process C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	Not Rec. +12V	JC-1 (Luminance)
2	Rec. +12V	JC-2 (Luminance)
3	LPⒽ	JC-3 (Luminance)
4	—	—
5	629kHz Rec. Chroma	JC-5 (Luminance)

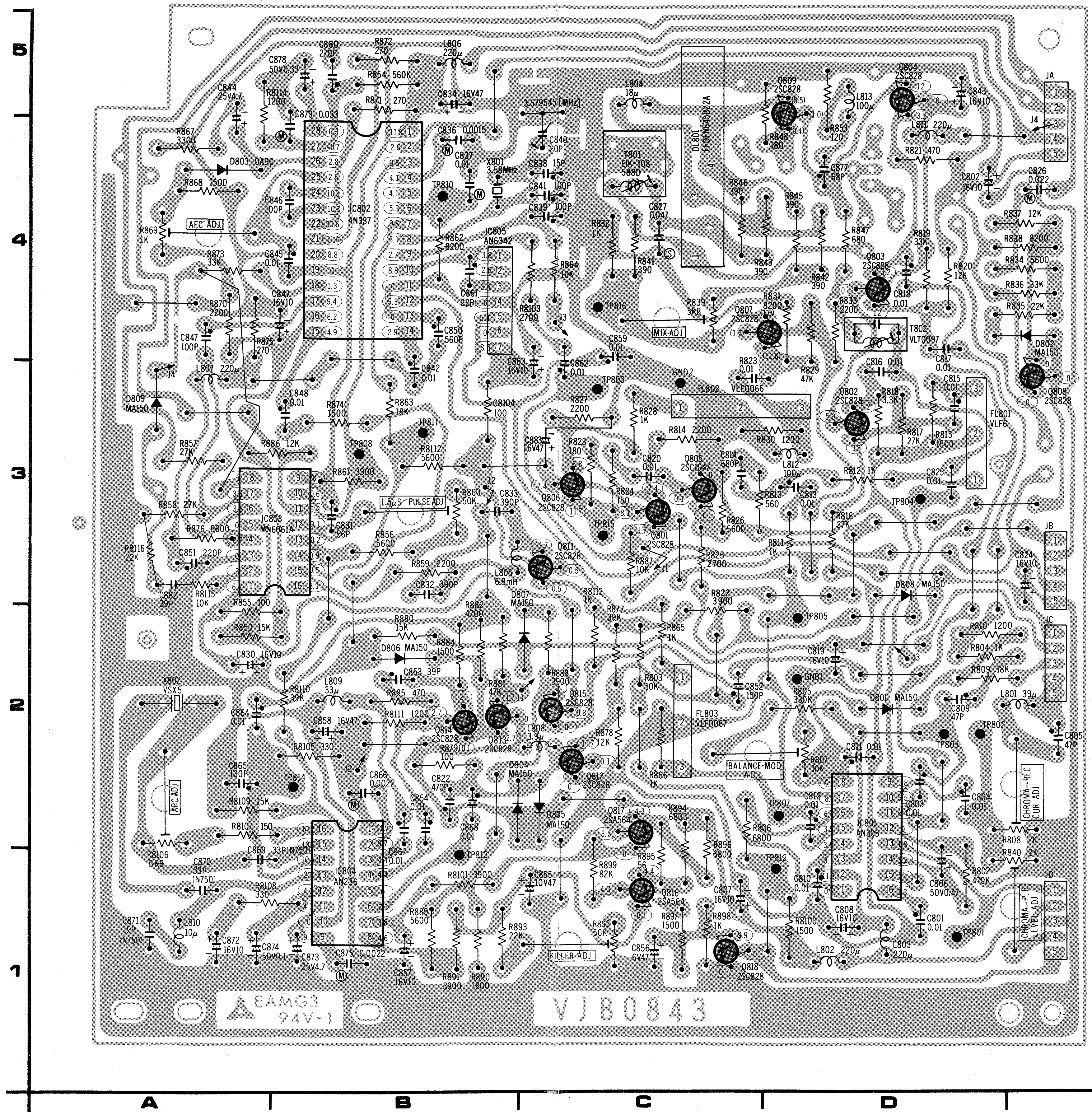
JD (Chrominance Process C.B.A. ↔ Luminance Process C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	Separated Chroma	JD-1 (Luminance)
2	+12V	JD-2 (Luminance)
3	GND	JD-3 (Luminance)
4	P.B. 3.58MHz Chroma	JD-4 (Luminance)
5	Color Killer	JD-5 (Luminance)


Chrominance Process C.B.A. (VEP0843A)


C840
TP810
AFC ADJ
R869
MIX ADJ
R839
TP816
TP811
TP809
GND2
TP808
1.5 μS
PULSE
ADJ
R860
TP815
TP804
TP805
GND 1
BALANCE
MOD ADJ
R807
TP803
TP802
TP814
CHROMA REC
CUR ADJ
R 808
TP807
APC ADJ
R8106
TP813
TP812
CHROMA P.B.
LEVEL ADJ
R840
KILLER ADJ
R892
TP801

CHROMINANCE PROCESS CIRCUIT BOARD (VEP0843A)



5
4
3
2
1
A
B
C
D
E
IC802 AN337
IC805 AN6342
IC803 MN6061A
IC804 AN236
IC801 AN305
X801 3.58MHz
3.579545 [MHz]
T801 EIK-10S 588D
DL801 EFDEN645822A
T802 VLT0097
FL801 VLF6
FL802 VLF0066
FL803 VLF0067
X802 VSX5
AFC ADJ
MIX ADJ
1.5μS PULSE ADJ
APC ADJ
BALANCE MOD ADJ
KILLER ADJ
CHROMA REC CUR ADJ
CHROMA P.B LEVEL ADJ
JA
JB
JC
JD
EAMG3 94V-1
VJB0843

Chrominance Process Circuit	
Q801	C-3
Q802	D-3
Q803	D-4
Q804	D-5
Q805	D-5
Q806	C-3
Q807	D-4
Q808	E-3
Q809	D-5
Q811	C-3
Q812	C-2
Q813	B-2
Q814	B-2
Q815	C-2
Q816	C-1
Q817	C-2
Q818	C-1
IC801	D-2
IC802	B-4
IC803	B-3
IC804	B-1
IC805	B-4

JA

1	30 HZ PG
2	D.O.C PULSE
3	SYNC FRONT PULSE
4	+12V
5	GND

JB

1	BURST GATE
2	VIDEO FOR H.S.S
3	
4	60 HZ OSC
5	GND

JC

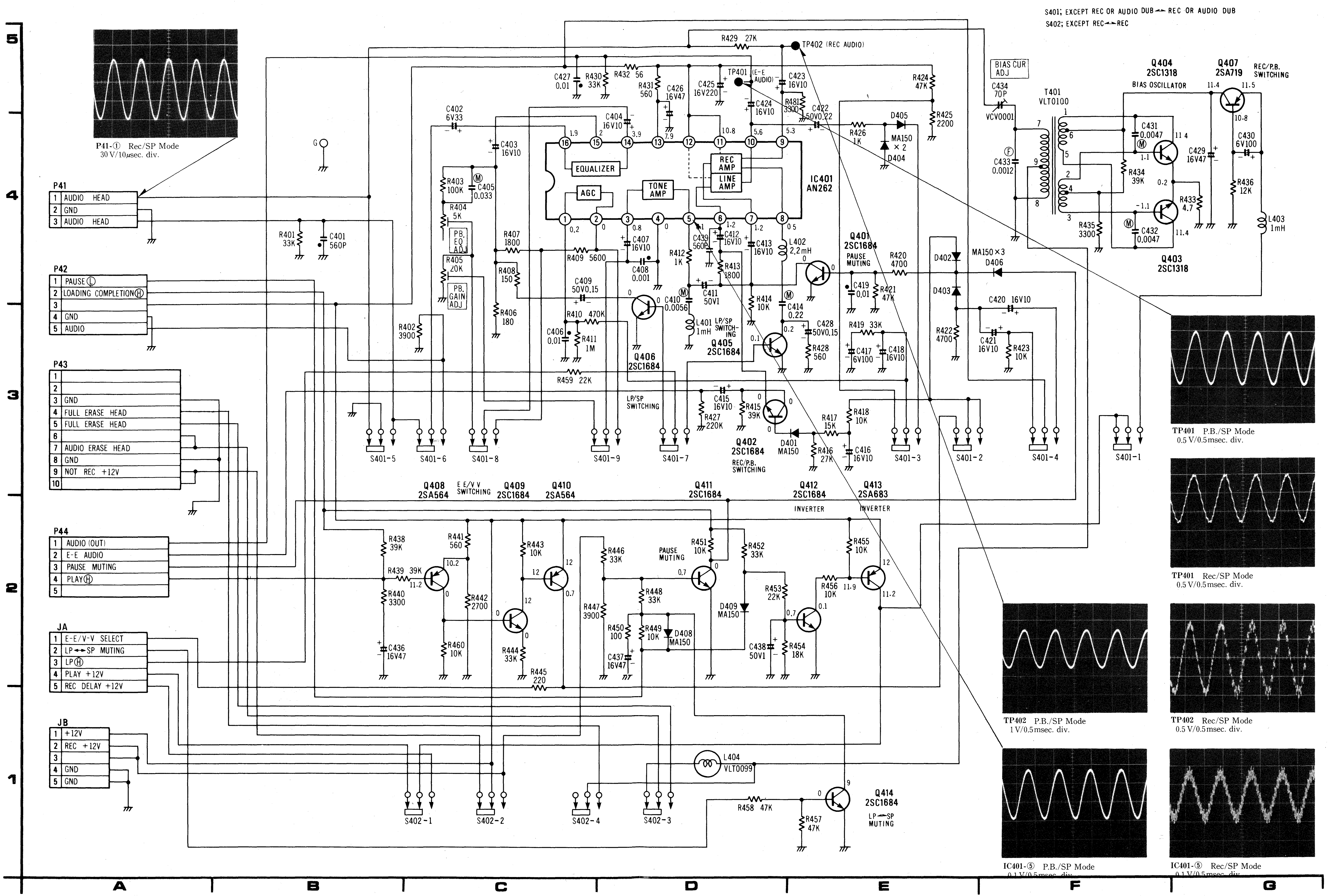
1	NOT REC +12V
2	REC +12 V
3	LP Ⓗ
4	
5	629 KHZ REC CHROMA

JD

1	SEPARATED CHROMA
2	+12 V
3	GND
4	P.B 3.58MHZ CHROMA
5	COLOR KILLER

AUDIO SCHEMATIC DIAGRAM

S401; EXCEPT REC OR AUDIO DUB⇀↽REC OR AUDIO DUB
S402; EXCEPT REC⇀↽REC


5
4
3
2
1
A
B
C
D
E
F
G
P41
1 AUDIO HEAD
2 GND
3 AUDIO HEAD
P42
1 PAUSE Ⓛ
2 LOADING COMPLETION Ⓗ
3
4 GND
5 AUDIO
P43
1
2
3 GND
4 FULL ERASE HEAD
5 FULL ERASE HEAD
6
7 AUDIO ERASE HEAD
8 GND
9 NOT REC +12V
10
P44
1 AUDIO (OUT)
2 E-E AUDIO
3 PAUSE MUTING
4 PLAY Ⓗ
5
JA
1 E-E/V-V SELECT
2 LP⇀↽SP MUTING
3 LP Ⓗ
4 PLAY +12V
5 REC DELAY +12V
JB
1 +12V
2 REC +12V
3
4 GND
5 GND
IC401 AN262
EQUALIZER
AGC
TONE AMP
REC AMP
LINE AMP
TP401 (E-E AUDIO)
TP402 (REC AUDIO)
R429 27K
BIAS CUR ADJ
C434 70P
VCV0001
T401 VLT0100
Q404 2SC1318 BIAS OSCILLATOR
Q403 2SC1318
Q407 2SA719 REC/P.B. SWITCHING
Q401 2SC1684 PAUSE MUTING
Q402 2SC1684 REC/P.B. SWITCHING
Q405 2SC1684 LP/SP SWITCHING
Q406 2SC1684
LP/SP SWITCHING
PB. EQ ADJ
PB. GAIN ADJ
D405 MA150 ×2 D404
MA150×3 D406
D401 MA150
L401 1mH
L402 2.2mH
L403 1mH
S401-1
S401-2
S401-3
S401-4
S401-5
S401-6
S401-7
S401-8
S401-9
Q408 2SA564
E E/V V SWITCHING
Q409 2SC1684
Q410 2SA564
Q411 2SC1684 PAUSE MUTING
Q412 2SC1684 INVERTER
Q413 2SA683 INVERTER
D409 MA150
D408 MA150
L404 VLT0099
Q414 2SC1684 LP⇀↽SP MUTING
R458 47K
R457 47K
S402-1
S402-2
S402-3
S402-4
G

P41-① Rec/SP Mode
30 V/10μsec. div.

TP401 P.B./SP Mode
0.5 V/0.5msec. div.

TP401 Rec/SP Mode
0.5 V/0.5msec. div.

TP402 P.B./SP Mode
1 V/0.5msec. div.

TP402 Rec/SP Mode
0.5 V/0.5msec. div.

IC401-⑤ P.B./SP Mode
0.1 V/0.5msec. div.

IC401-⑤ Rec/SP Mode
0.1 V/0.5msec. div.

AUDIO CIRCUIT BOARD (VEP0441A)

P41 (Audio C.B.A.)		
PIN NO.	SIGNAL NAME	DESTINATION
1	Audio Head	H6303-A (Audio Head)
2	GND	—
3	Audio Head	H6303-A (Audio Head)

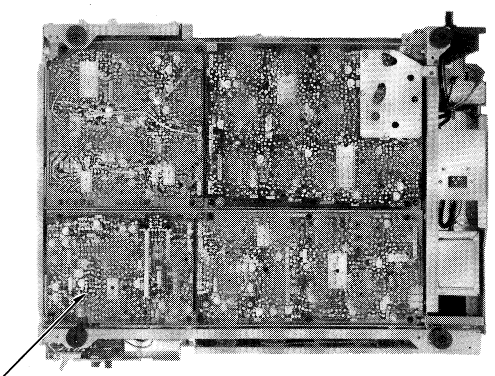
P42 (Audio C.B.A.)		
PIN NO.	SIGNAL NAME	DESTINATION
1	Pause Ⓛ	P65-8 (Reg. & Transport)
2	Loading Completion Ⓗ	P64-1 (Reg. & Transport)
3	—	—
4	GND	P602-1 (Mic Jack Connection)
5	Audio	P602-2 (Mic Jack Connection)

P43 (Audio C.B.A.)		
PIN NO.	SIGNAL NAME	DESTINATION
1	—	—
2	—	—
3	GND	—
4	Full Erase Head	H6304 (Full Erase Head)
5	Full Erase Head	H6304 (Full Erase Head)
6	—	—
7	Audio Erase Head	P612-1 (Audio/Control Head Connection)
8	GND	P612-2 (Audio/Control Head Connection)
9	Not Rec. +12V	P32-1 (Luminance Process)
10	—	—

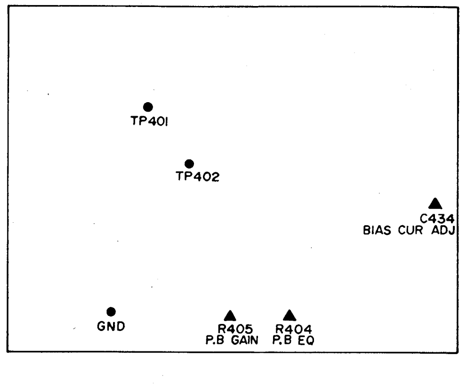
P44 (Audio C.B.A.)		
PIN NO.	SIGNAL NAME	DESTINATION
1	Audio (Out)	P601-8 (Rear Jack)
2	E-E Audio	P604-3 (TV/Camera Input Selector)
3	Pause Muting	P32-6 (Luminance Process)
4	Play Ⓗ	P65-4 (Reg. & Transport)
5	—	—

JA (Audio C.B.A.)		
PIN NO.	SIGNAL NAME	DESTINATION
1	E-E/V-V Select	J1-1 (Servo)
2	LP↔SP Muting	J1-2 (Servo)
3	LPⒽ	J1-3 (Servo)
4	Play +12V	J1-4 (Servo)
5	Rec. Delay +12V	J1-5 (Servo)

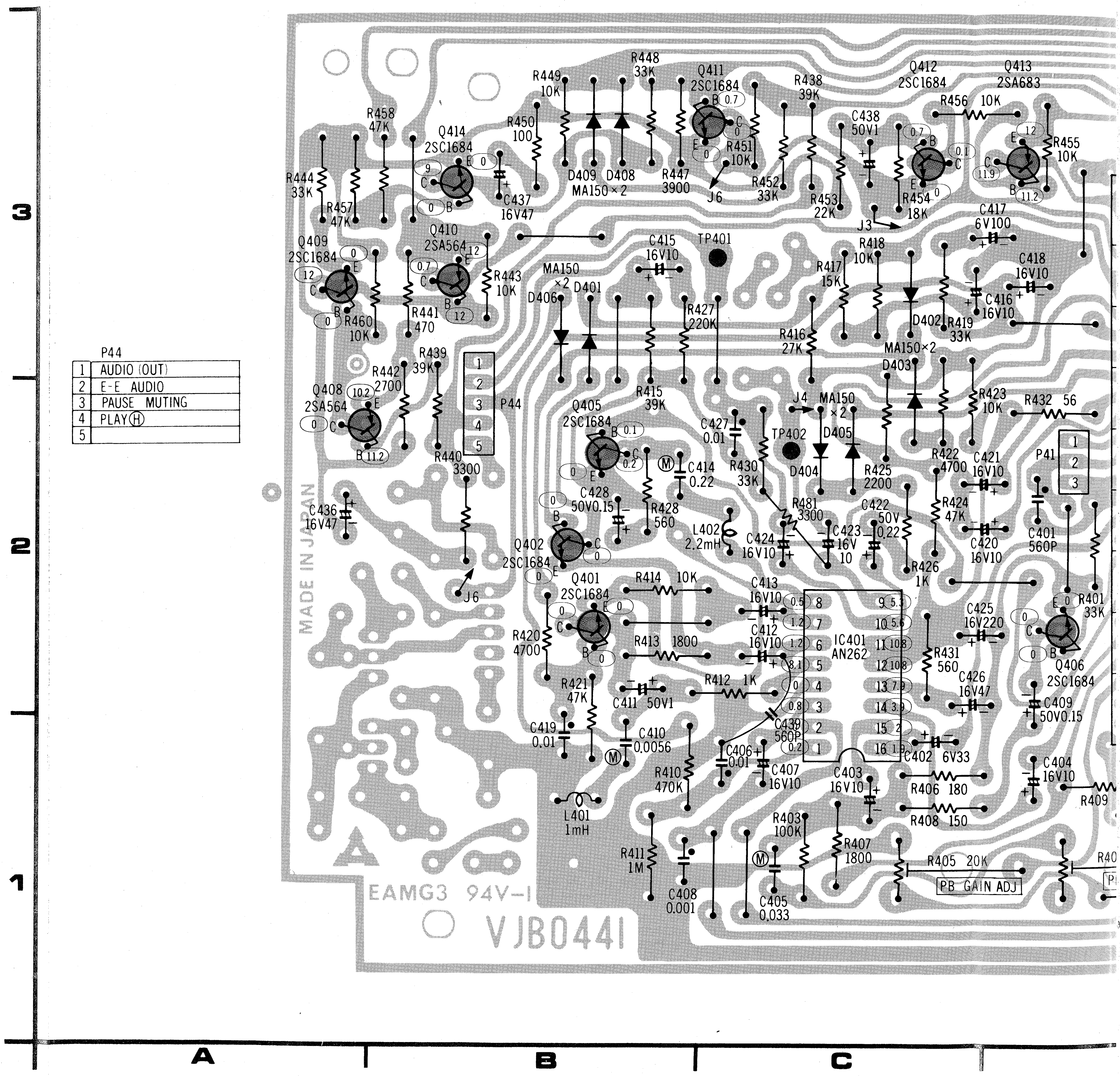
JB (Audio C.B.A.)		
PIN NO.	SIGNAL NAME	DESTINATION
1	+12V	J2-1 (Servo)
2	Rec. +12V	J2-2 (Servo)
3	—	—
4	GND	J2-4 (Servo)
5	GND	J2-5 (Servo)



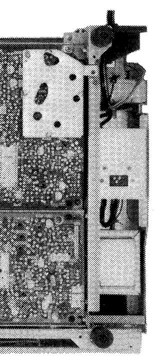
Audio C.B.A. (VEP0441A)

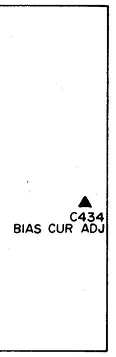

TP401
TP402
C434
BIAS CUR ADJ
GND
R405
P.B GAIN
R404
P.B EQ

Audio Circuit	
Q401	B-2
Q402	B-2
Q403	E-1
Q404	E-1
Q405	B-2
Q406	D-2
Q407	D-1
Q408	A-2
Q409	A-3
Q410	B-3
Q411	C-3
Q412	C-3
Q413	D-3
Q414	B-3


3
2
1
A
B
C
P44
1 AUDIO (OUT)
2 E-E AUDIO
3 PAUSE MUTING
4 PLAYⒽ
5
P41
TP401
TP402
IC401 AN262
Q401 2SC1684
Q402 2SC1684
Q405 2SC1684
Q406 2SC1684
Q408 2SA564
Q409 2SC1684
Q410 2SA564
Q411 2SC1684
Q412 2SC1684
Q413 2SA683
Q414 2SC1684
D408 D409 MA150×2
D402 D403 MA150×2
D404 D405 MA150×2
D401 D406 MA150×2
J3
J4
J6
L401 1mH
L402 2.2mH
R405 20K
PB GAIN ADJ
R448 33K
R449 10K
R450 100
R458 47K
R444 33K
R457 47K
R438 39K
R456 10K
R455 10K
R447 3900
R451 10K
R452 33K
R453 22K
R454 18K
R443 10K
R441 470
R460 10K
R442 2700
R439 39K
R440 3300
R415 39K
R427 220K
R416 27K
R417 15K
R418 10K
R419 33K
R423 10K
R432 56
R422 4700
R424 47K
R425 2200
R426 1K
R430 33K
R481 3300
R428 560
R414 10K
R413 1800
R412 1K
R420 4700
R421 47K
R410 470K
R411 1M
R403 100K
R407 1800
R406 180
R408 150
R431 560
R401 33K
C437 16V47
C438 50V1
C415 16V10
C417 6V100
C418 16V10
C416 16V10
C427 0.01
C414 0.22
C428 50V0.15
C436 16V47
C421 16V10
C420 16V10
C401 560P
C422 50V0.22
C423 16V10
C424 16V10
C413 16V10
C412 16V10
C411 50V1
C419 0.01
C410 0.0056
C406 0.01
C439 560P
C407 16V10
C403 16V10
C402 6V33
C404 16V10
C425 16V220
C426 16V47
C409 50V0.15
C408 0.001
C405 0.033
MADE IN JAPAN
EAMG3 94V-I
VJB0441

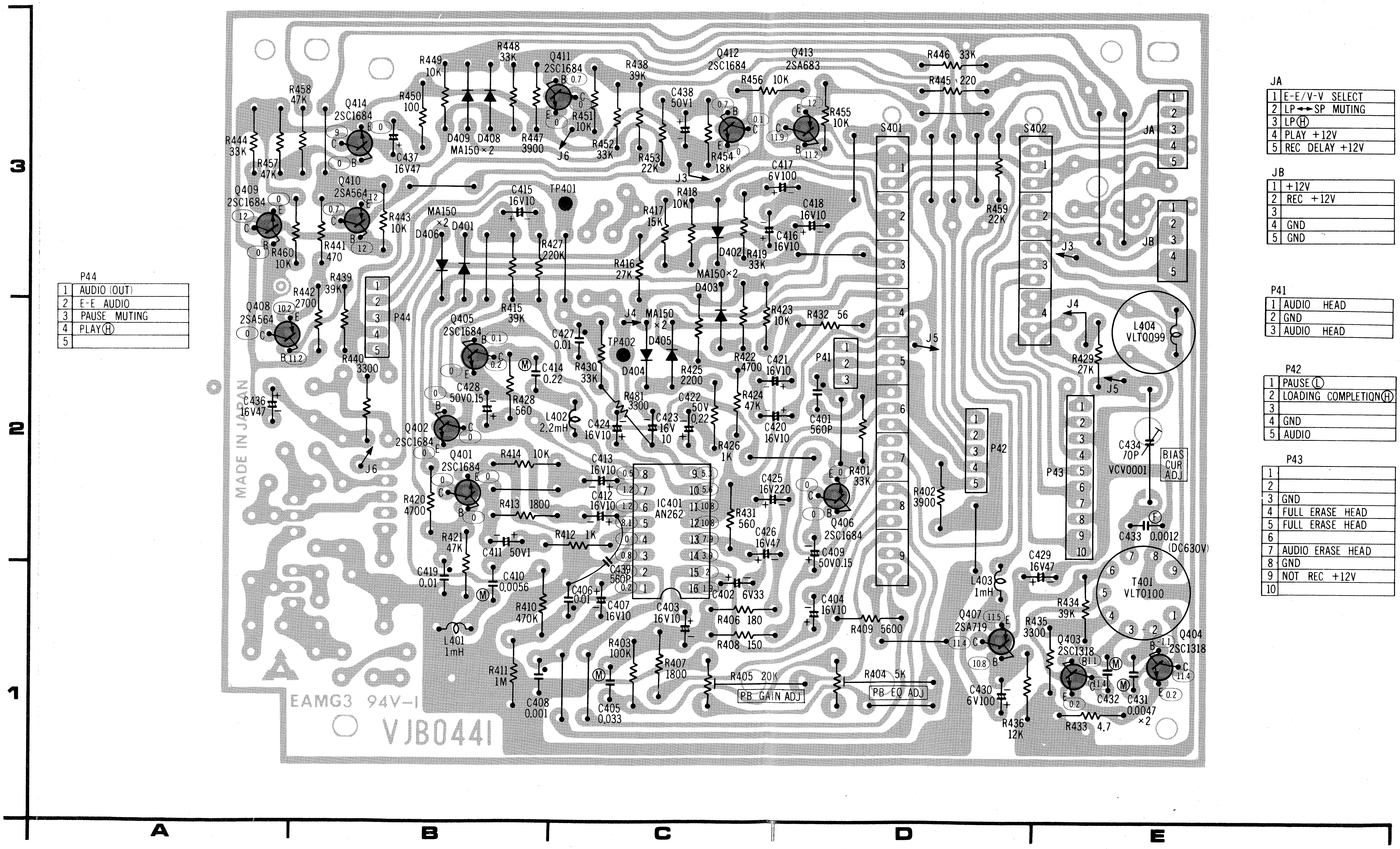
AUDIO CIRCUIT BOARD (VEP0441A)




C434
BIAS CUR ADJ

P44

1	AUDIO (OUT)
2	E-E AUDIO
3	PAUSE MUTING
4	PLAY Ⓗ
5	


3
2
1
A
B
C
D
E
R449 10K
R448 33K
Q411 2SC1684
R438 39K
Q412 2SC1684
Q413 2SA683
R446 33K
R445 220
R458 47K
Q414 2SC1684
R450 100
D409 D408 MA150×2
R447 3900
R451 10K
R452 33K
J6
C438 50V1
R456 10K
R455 10K
R453 22K
R454 18K
J3
S401
S402
JA
JB
R444 33K
R457 47K
C437 16V47
Q409 2SC1684
Q410 2SA564
R443 10K
R441 470
R460 10K
MA150 ×2
D401
D406
C415 16V10
TP401
R427 220K
R417 15K
R418 10K
C417 6V100
C418 16V10
C416 16V10
D402
R419 33K
R459 22K
R416 27K
MA150×2
D403
R442 2700
R439 39K
Q408 2SA564
P44
R415 39K
Q405 2SC1684
J4
MA150 ×2
D405
R423 10K
R432 56
J5
L404 VLT0099
C427 0.01
TP402
D404
R425 2200
R422 4700
C421 16V10
P41
R429 27K
R440 3300
C414 0.22
R430 33K
C428 50V0.15
R428 560
R481 3300
C422 50V 0.22
R424 47K
C420 16V10
C401 560P
C436 16V47
MADE IN JAPAN
Q402 2SC1684
L402 2.2mH
C424 16V10
C423 16V 10
R426 1K
P42
P43
C434 70P VCV0001
BIAS CUR ADJ
Q401 2SC1684
R414 10K
C413 16V10
C412 16V10
IC401 AN262
C425 16V220
R401 33K
Q406 2SC1684
R402 3900
R420 4700
R413 1800
R431 560
R421 47K
C411 50V1
R412 1K
C426 16V47
C409 50V0.15
C433 0.0012 (DC630V)
C439 560P
C429 16V47
T401 VLT0100
C419 0.01
C410 0.0056
C406 0.01
C407 16V10
C402 6V33
C404 16V10
L403 1mH
R410 470K
C403 16V10
R406 180
R409 5600
Q407 2SA719
R434 39K
R435 3300
Q403 2SC1318
Q404 2SC1318
L401 1mH
R403 100K
R407 1800
R408 150
R411 1M
R405 20K
PB GAIN ADJ
R404 5K
PB EQ ADJ
C430 6V100
C432
C431 0.0047 ×2
C408 0.001
C405 0.033
R436 12K
R433 4.7
EAMG3 94V-I
VJB0441

JA

1	E-E/V-V SELECT
2	LP↔SP MUTING
3	LP Ⓗ
4	PLAY +12V
5	REC DELAY +12V

JB

1	+12V
2	REC +12V
3	
4	GND
5	GND

P41

1	AUDIO HEAD
2	GND
3	AUDIO HEAD

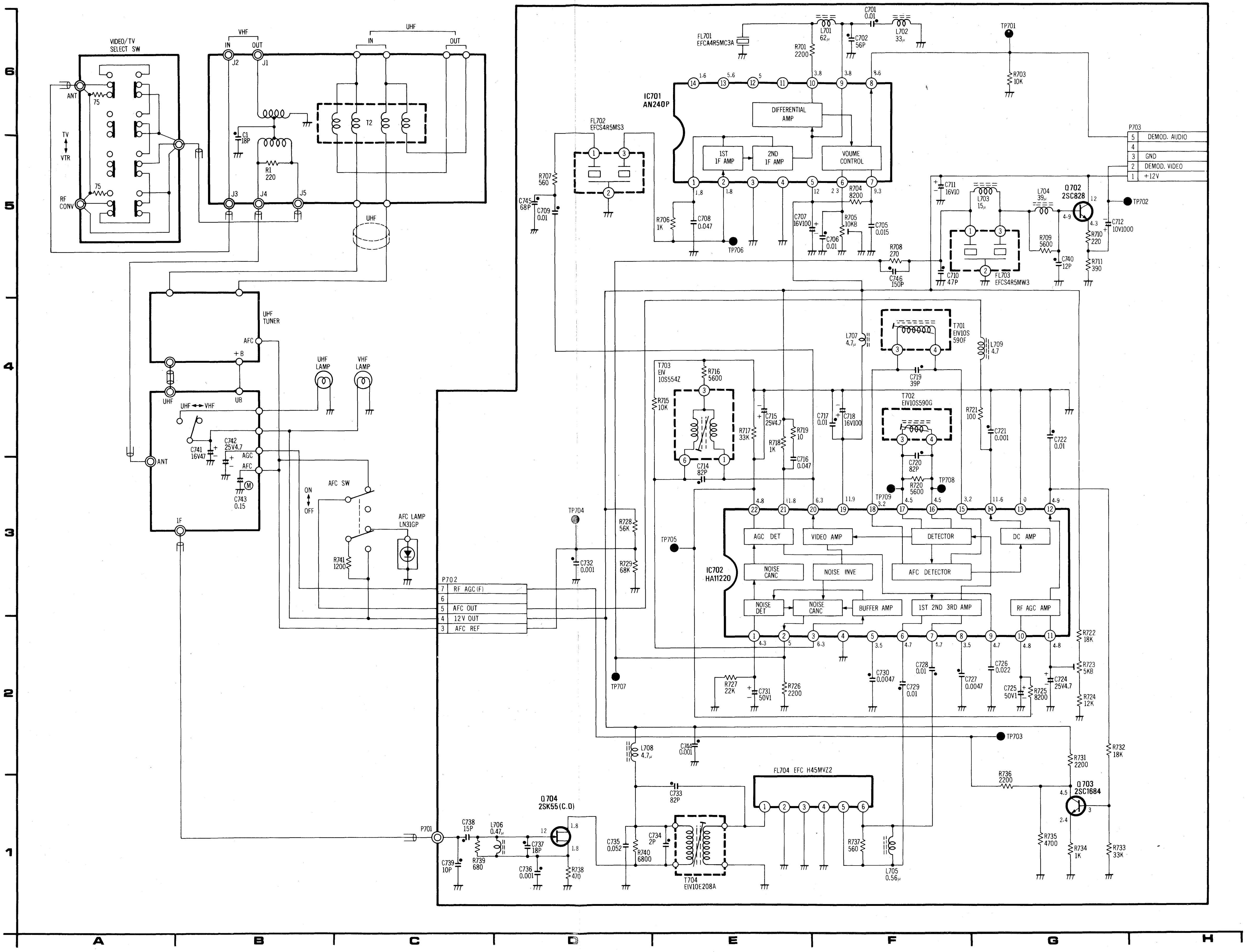
P42

1	PAUSE Ⓛ
2	LOADING COMPLETION Ⓗ
3	
4	GND
5	AUDIO

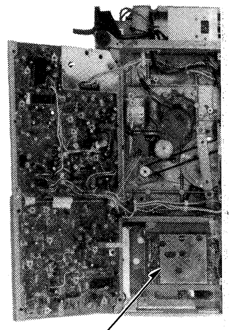
P43

1	
2	
3	GND
4	FULL ERASE HEAD
5	FULL ERASE HEAD
6	
7	AUDIO ERASE HEAD
8	GND
9	NOT REC +12V
10	

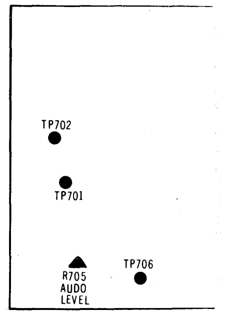
TV DEMODULATOR SCHEMATIC DIAGRAM


VIDEO/TV SELECT SW
ANT
75
TV
VTR
RF CONV
VHF
IN
OUT
J2
J1
C1 18P
R1 220
J3
J4
J5
UHF
T2
UHF TUNER
AFC
+B
UB
UHF ←→ VHF
ANT
IF
C741 16V47
C742 25V4.7
AGC
C743 0.15
UHF LAMP
VHF LAMP
AFC SW
ON
OFF
AFC LAMP LN31GP
R741 1200
P702
7 RF AGC (F)
6
5 AFC OUT
4 12V OUT
3 AFC REF
FL701 EFCA4R5MC3A
R701 2200
L701 62μ
C701 0.01
C702 56P
L702 33μ
TP701
R703 10K
IC701 AN240P
DIFFERENTIAL AMP
1ST IF AMP
2ND IF AMP
VOUME CONTROL
FL702 EFCS4R5MS3
R707 560
C745 68P
C709 0.01
R706 1K
C708 0.047
TP706
C707 16V100
C706 0.01
R705 10KB
R704 8200
C705 0.015
R708 270
C746 150P
C711 16V10
L703 15μ
L704 39μ
Q702 2SC828
R709 5600
C740 12P
C710 47P
FL703 EFCS4R5MW3
R710 220
C712 10V1000
R711 390
TP702
P703
5 DEMOD. AUDIO
4
3 GND
2 DEMOD. VIDEO
1 +12V
L707 4.7μ
T701 EIV10S 590F
L709 4.7
C719 39P
T703 EIV 10S554Z
R716 5600
R715 10K
C714 82P
R717 33K
C715 25V4.7
R718 1K
R719 10
C716 0.047
C717 0.01
C718 16V100
T702 EIV10S590G
C720 82P
R720 5600
TP709
TP708
R721 100
C721 0.001
C722 0.01
TP704
C732 0.001
R728 56K
R729 68K
TP705
IC702 HA11220
AGC DET
VIDEO AMP
DETECTOR
DC AMP
NOISE CANC
NOISE INVE
AFC DETECTOR
NOISE DET
NOISE CANC
BUFFER AMP
1ST 2ND 3RD AMP
RF AGC AMP
TP707
R727 22K
C731 50V1
R726 2200
C730 0.0047
C728 0.01
C729 0.01
C727 0.0047
C726 0.022
C725 50V1
R725 8200
C724 25V4.7
R722 18K
R723 5KB
R724 12K
TP703
L708 4.7μ
C744 0.001
C733 82P
FL704 EFC H45MVZ2
R731 2200
R732 18K
R736 2200
Q703 2SC1684
Q704 2SK55(C.D)
P701
C738 15P
L706 0.47μ
C737 18P
C739 10P
R739 680
C736 0.001
R738 470
C735 0.052
C734 2P
R740 6800
T704 EIV10E208A
R737 560
L705 0.56μ
R735 4700
R734 1K
R733 33K
1
2
3
4
5
6
A
B
C
D
E
F
G
H

P703 (TV D		
PIN NO.	SIGNAL NAME	
1	+12V	P3
2	Demod. Video	P6
3	GND	P6
4	GND	
5	Demod. Audio	P6

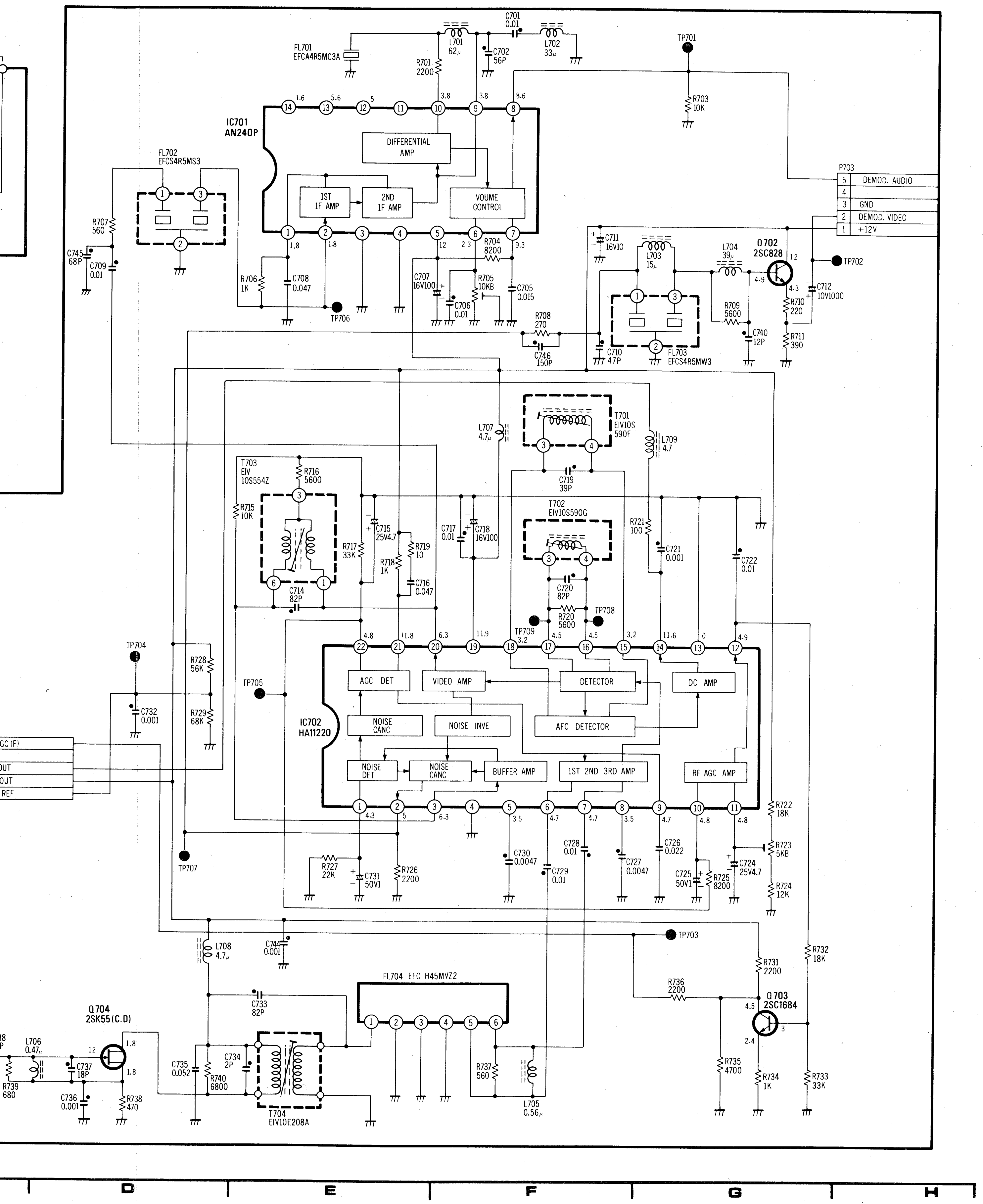


TV Demod

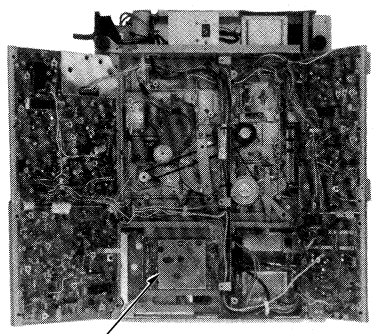

TP702
TP701
R705 AUDIO LEVEL
TP706

TV Demo Circuit
Q702
Q703
Q704
IC701
IC702

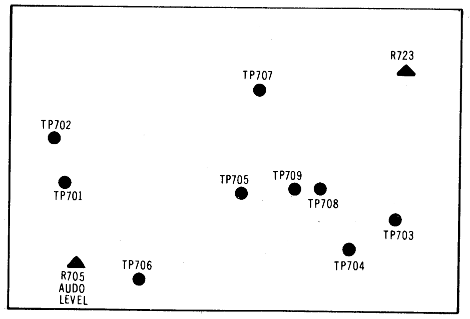
C DIAGRAM


IC701
AN240P
DIFFERENTIAL AMP
1ST IF AMP
2ND IF AMP
VOUME CONTROL
FL701 EFCA4R5MC3A
FL702 EFCS4R5MS3
FL703 EFCS4R5MW3
FL704 EFC H45MVZ2
L701 62μ
L702 33μ
C701 0.01
C702 56P
R701 2200
R703 10K
TP701
TP702
TP703
TP704
TP705
TP706
TP707
TP708
TP709
Q702 2SC828
Q703 2SC1684
Q704 2SK55(C.D)
P703
5 DEMOD. AUDIO
4
3 GND
2 DEMOD. VIDEO
1 +12V
IC702
HA11220
AGC DET
VIDEO AMP
DETECTOR
DC AMP
NOISE CANC
NOISE INVE
AFC DETECTOR
NOISE DET
BUFFER AMP
1ST 2ND 3RD AMP
RF AGC AMP
T701 EIV10S 590F
T702 EIV10S590G
T703 EIV 10S554Z
T704 EIV10E208A
L703 15μ
L704 39μ
L705 0.56μ
L706 0.47μ
L707 4.7μ
L708 4.7μ
L709 4.7
D
E
F
G
H

P703 (TV Demodulator)		
PIN NO.	SIGNAL NAME	DESTINATION
1	+12V	P33-9 (Luminance Process)
2	Demod. Video	P603-2 (TV/Camera Input Selector)
3	GND	P603-1 (TV/Camera Input Selector)
4	GND	—
5	Demod. Audio	P603-8 (TV/Camera Input Selector)

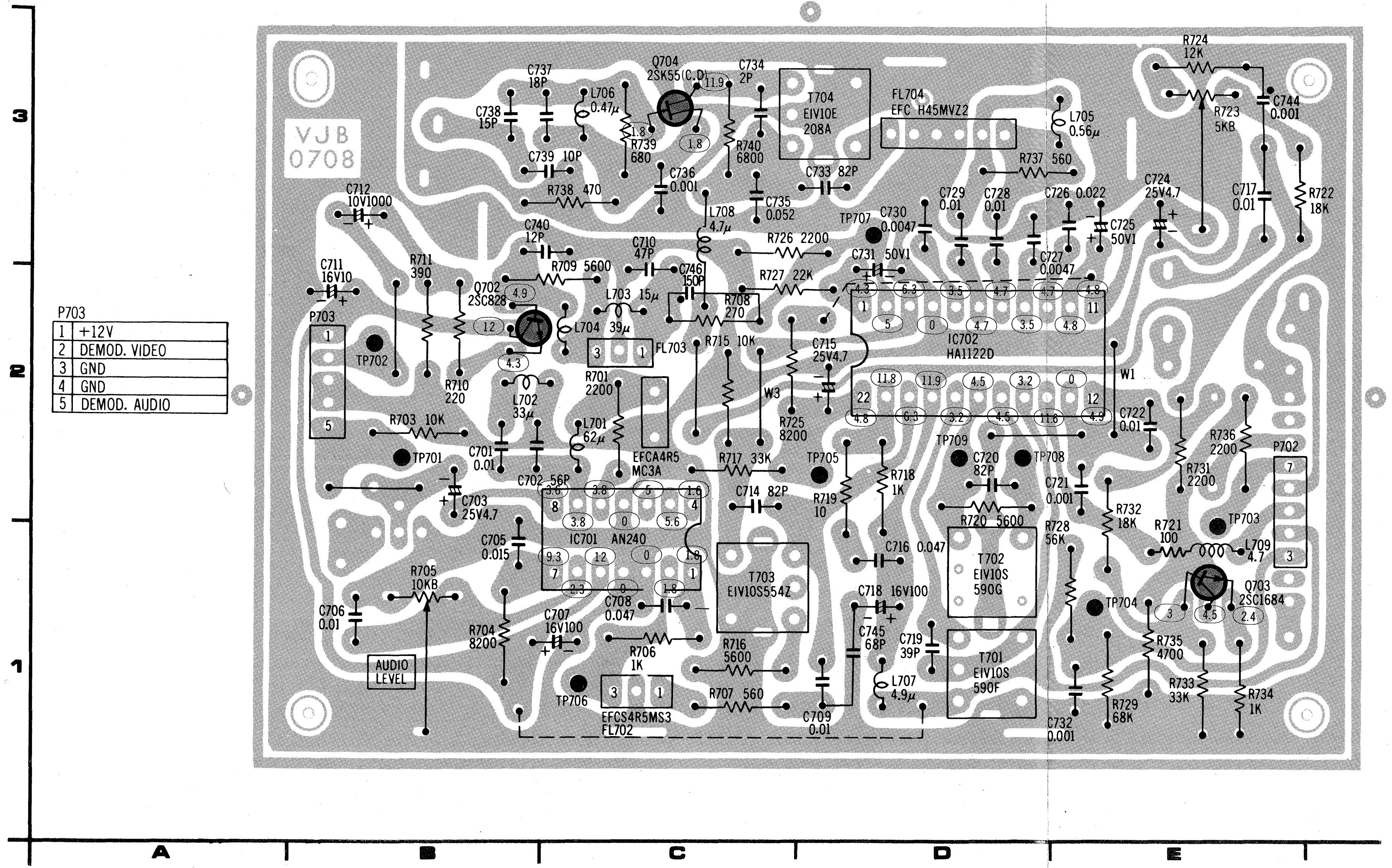


TV Demodulator C.B.A. (VEP0708A)


R723
TP707
TP702
TP701
TP705
TP709
TP708
TP703
TP706
TP704
R705
AUDIO
LEVEL

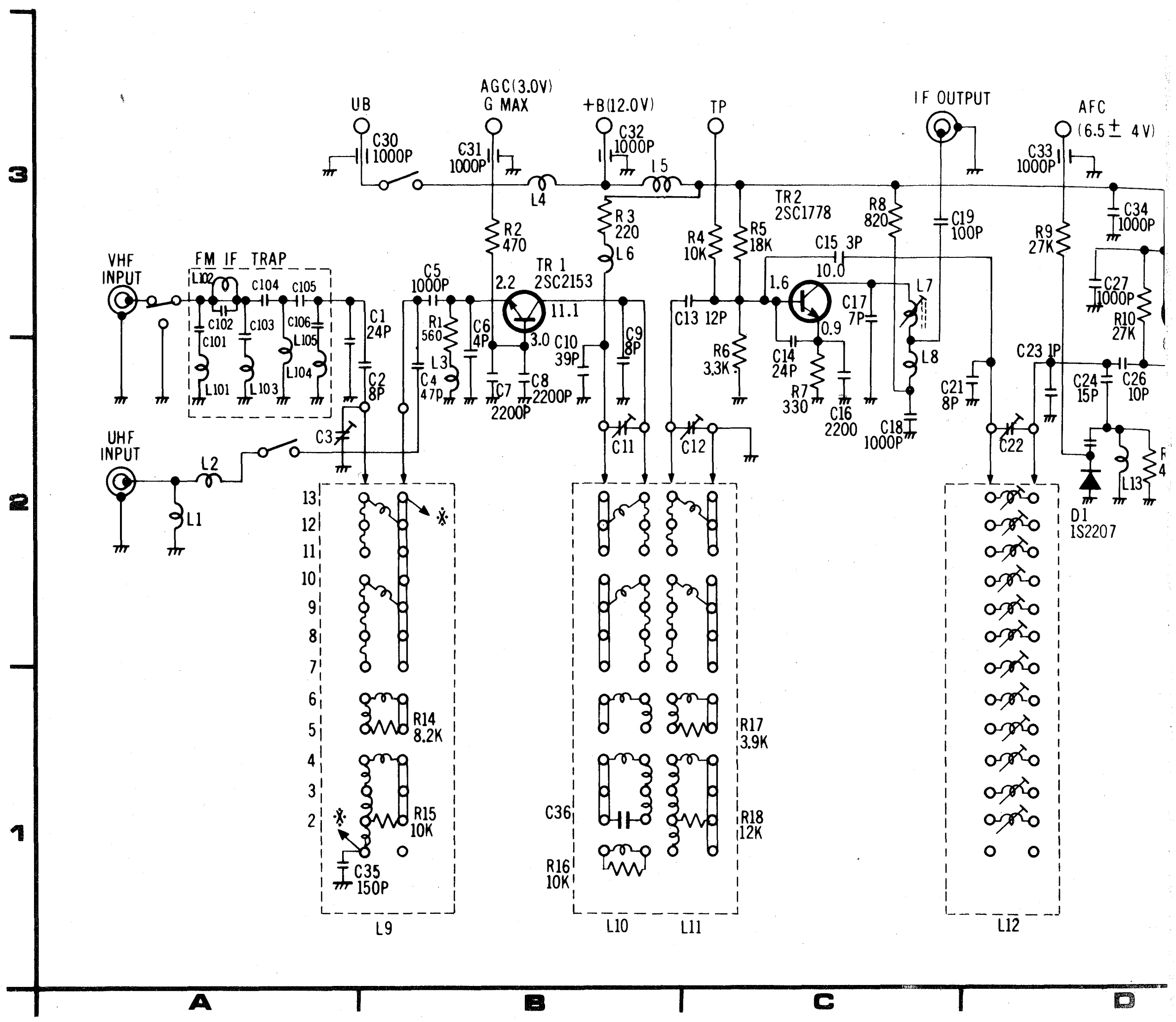
TV Demodulator Circuit	
Q702	B-2
Q703	E-1
Q704	C-3
IC701	C-1
IC702	D-2

TV DEMODULATOR CIRCUIT BOARD (VEP0708A)

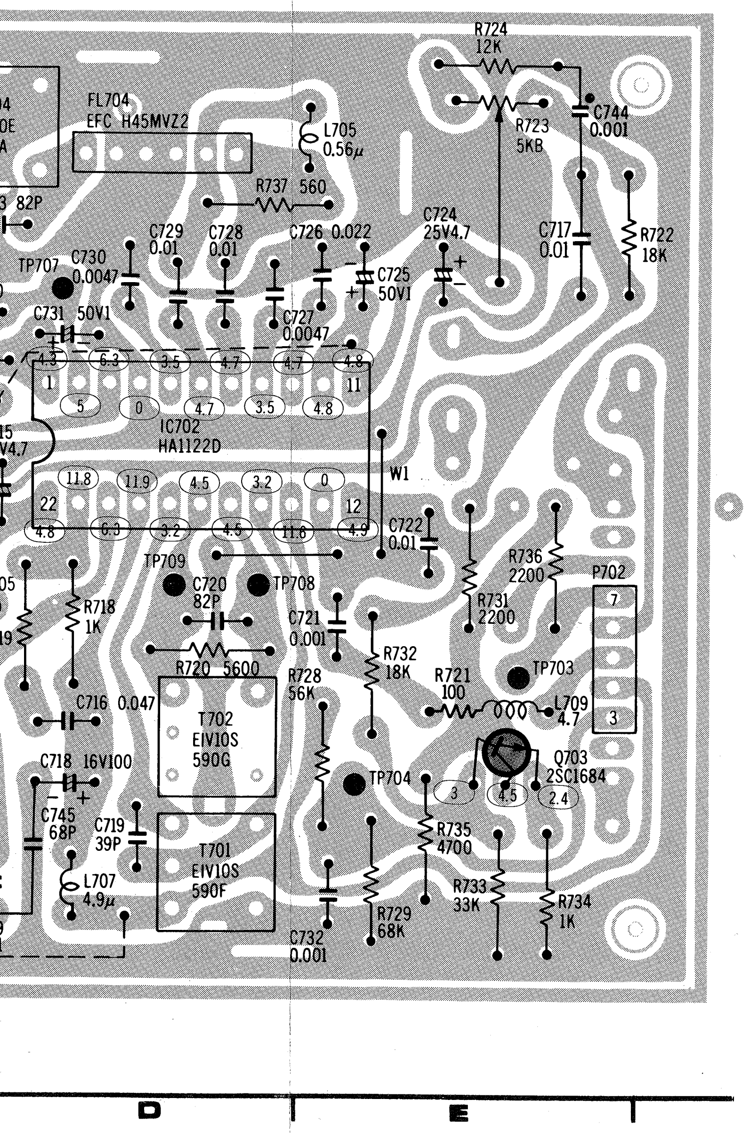

VJB
0708
P703
TP701
TP702
TP703
TP704
TP705
TP706
TP707
TP708
TP709
Q702 2SC828
Q703 2SC1684
Q704 2SK55(C,D)
IC701 AN240
IC702 HA1122D
T701 EIV10S 590F
T702 EIV10S 590G
T703 EIV10S554Z
T704 EIV10E 208A
FL701 EFCA4R5 MC3A
FL702 EFCS4R5MS3
FL703
FL704 EFC H45MVZ2
AUDIO LEVEL
R705 10KB
R723 5KB
R724 12K
P702
W1
W3
A
B
C
D
E
1
2
3

	P703
1	+12V
2	DEMOD. VIDEO
3	GND
4	GND
5	DEMOD. AUDIO

VHF TUNER SCHEMATIC DIAGRAM

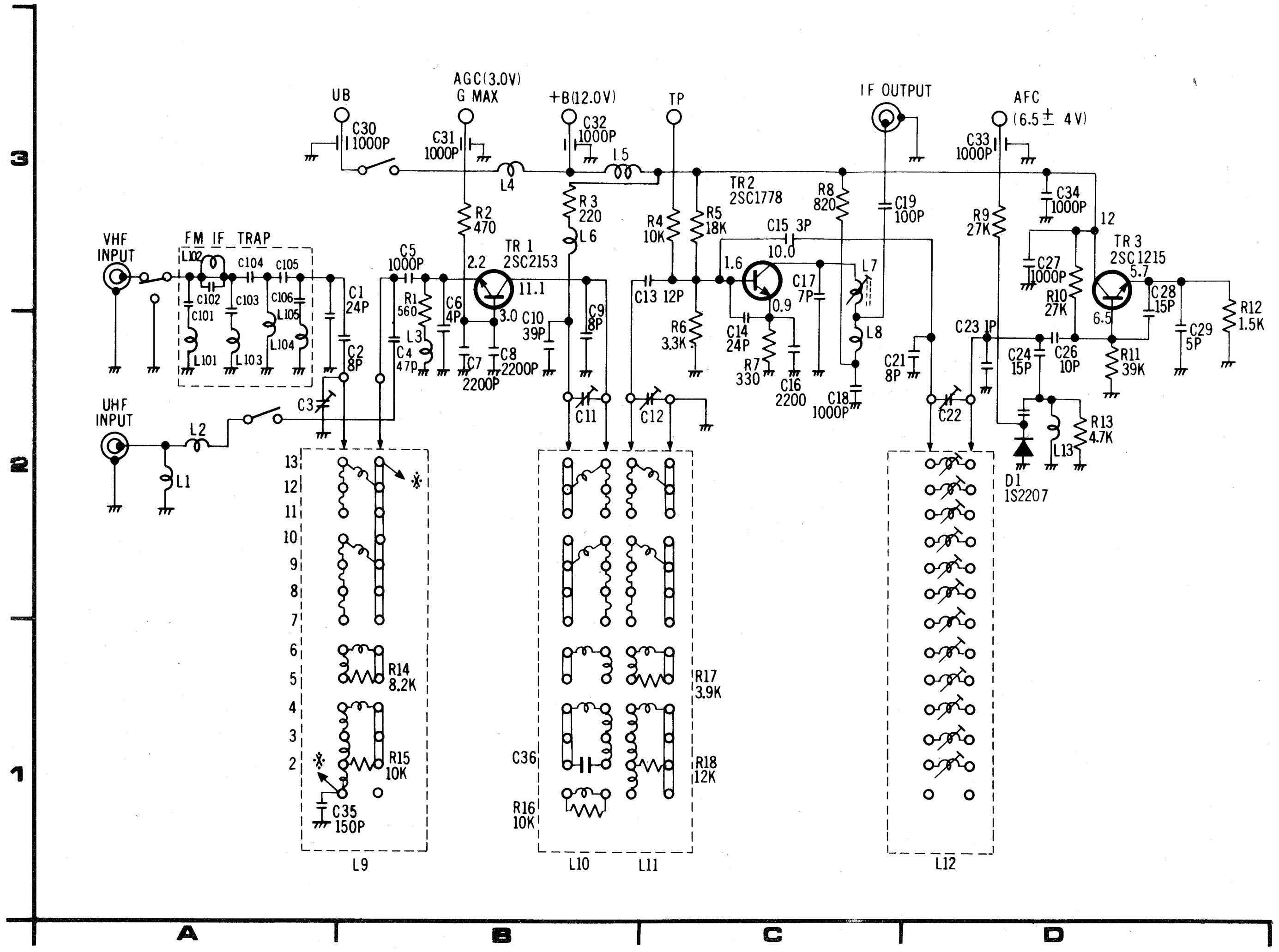

UB
AGC(3.0V) G MAX
+B(12.0V)
TP
IF OUTPUT
AFC (6.5± 4V)
VHF INPUT
UHF INPUT
FM IF TRAP
TR 1 2SC2153
TR2 2SC1778
D1 1S2207
L9
L10
L11
L12
A
B
C
D
1
2
3

EP0708A)



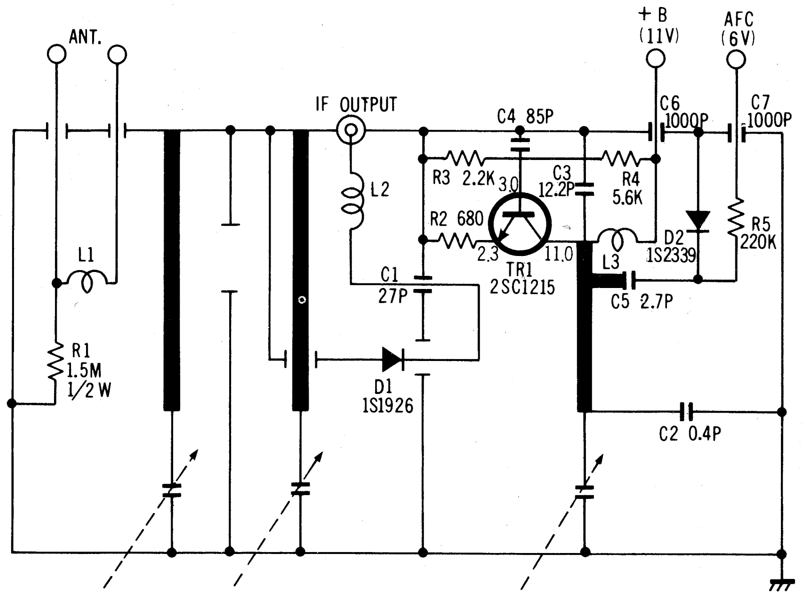
R724 12K
FL704 EFC H45MVZ2
L705 0.56μ
R723 5KB
C744 0.001
R737 560
C729 0.01
C728 0.01
C726 0.022
C724 25V4.7
C717 0.01
R722 18K
TP707
C730 0.0047
C725 50V1
C731 50V1
C727 0.0047
IC702 HA1122D
W1
C722 0.01
R736 2200
P702
TP709
C720 82P
TP708
C721 0.001
R718 1K
R731 2200
R720 5600
R728 56K
R732 18K
R721 100
TP703
C716 0.047
T702 EIV10S 590G
L709 4.7
C718 16V100
TP704
Q703 2SC1684
C745 68P
C719 39P
T701 EIV10S 590F
R735 4700
L707 4.9μ
C732 0.001
R729 68K
R733 33K
R734 1K
D
E

VHF TUNER SCHEMATIC DIAGRAM



UB
C30 1000P
AGC(3.0V) G MAX
C31 1000P
+B(12.0V)
C32 1000P
TP
IF OUTPUT
AFC (6.5 ± 4V)
C33 1000P
L4
L5
R2 470
R3 220
L6
TR 1 2SC2153
R4 10K
R5 18K
TR2 2SC1778
R8 820
C19 100P
R9 27K
C34 1000P
VHF INPUT
FM IF TRAP
C5 1000P
C1 24P
C2 8P
R1 560
L3
C4 47P
C6 4P
C7 2200P
C8 2200P
C10 39P
C9 8P
C13 12P
R6 3.3K
C15 3P
C17 7P
L7
L8
C14 24P
R7 330
C16 2200
C18 1000P
C21 8P
C23 1P
C24 15P
C26 10P
C27 1000P
R10 27K
TR 3 2SC1215
C28 15P
C29 5P
R12 1.5K
R11 39K
R13 4.7K
L13
D1 1S2207
UHF INPUT
L1
L2
C3
C11
C12
C22
L9
L10
L11
L12
R14 8.2K
R15 10K
C35 150P
C36
R16 10K
R17 3.9K
R18 12K
A
B
C
D
1
2
3

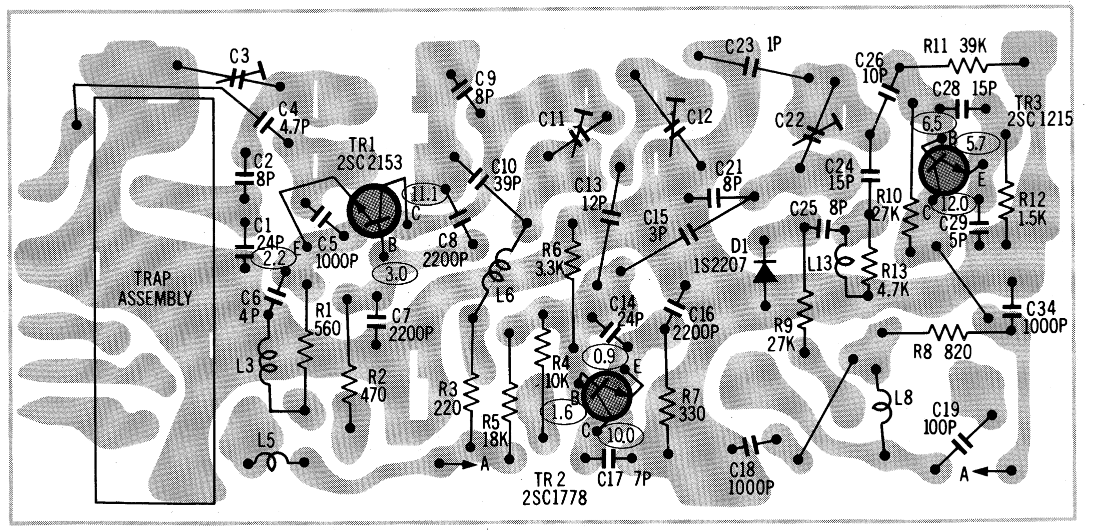
UHF TUNER SCHEMATIC DIAGRAM



ANT.
IF OUTPUT
+B (11V)
AFC (6V)
C4 85P
C6 1000P
C7 1000P
R3 2.2K
C3 12.2P
R4 5.6K
L2
R2 680
TR1 2SC1215
L3
D2 1S2339
R5 220K
L1
C1 27P
C5 2.7P
R1 1.5M 1/2W
D1 1S1926
C2 0.4P

NOTES
※ R1 1.5MΩ ± 10% (ERC 12GK155Z)
※ C2, C3, C5 MAY CHANGE WITHIN ± 1PF FOR QUALITY IMPROVEMENT

VHF TUNER CIRCUIT BOARD

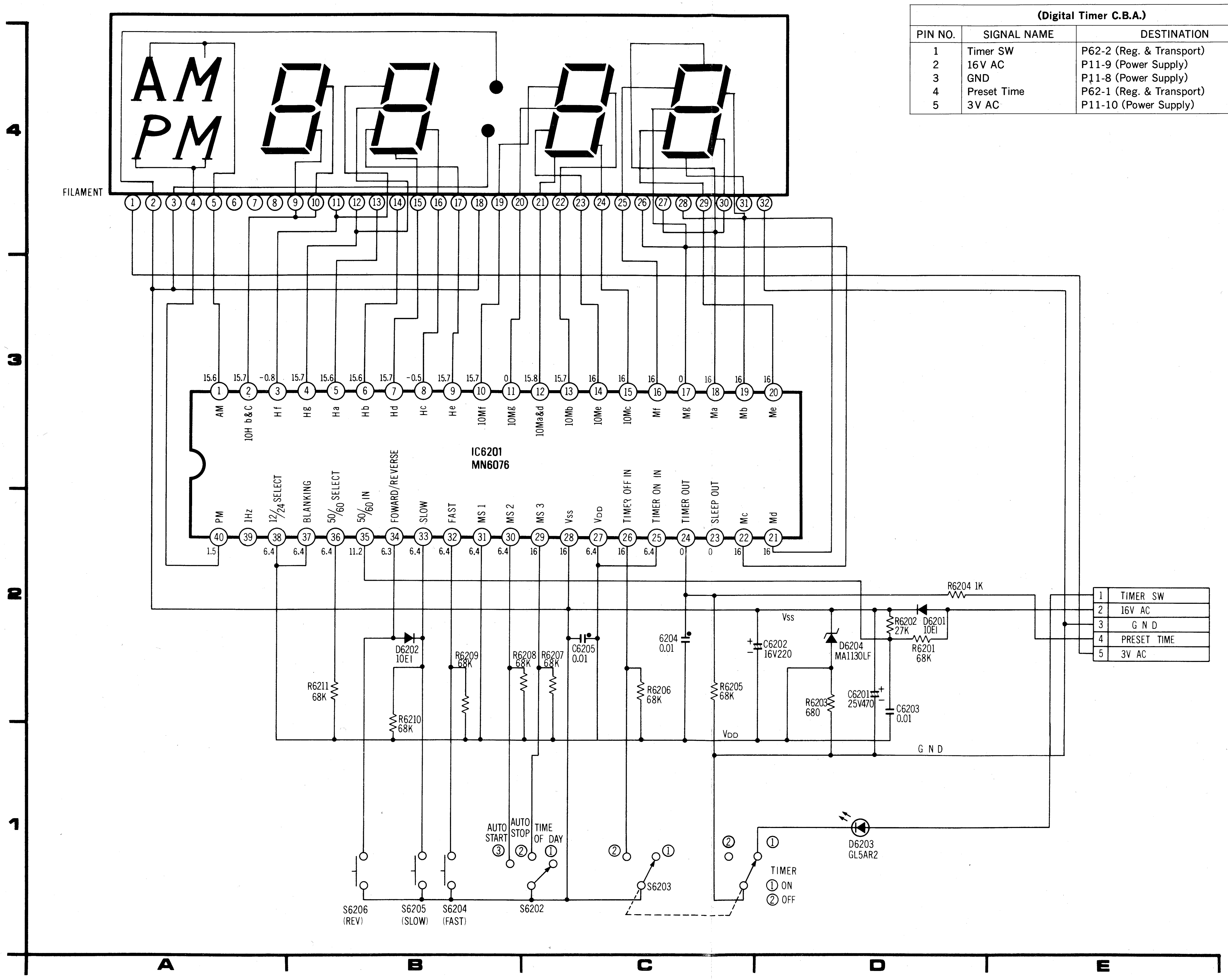


C3
C4 4.7P
C9 8P
C23 1P
C26 10P
R11 39K
C28 15P
TR3 2SC1215
TRAP ASSEMBLY
C2 8P
TR1 2SC2153
C10 39P
C11
C12
C22
C24 15P
C1 24P
C5 1000P
C8 2200P
C13 12P
C15 3P
C21 8P
C25 8P
R10 27K
C29 5P
R12 1.5K
C6 4P
R1 560
C7 2200P
R6 3.3K
D1 1S2207
L13
R13 4.7K
C34 1000P
L3
R2 470
L6
C14 24P
C16 2200P
R9 27K
R8 820
R4 10K
R3 220
R5 18K
R7 330
L8
C19 100P
L5
TR 2 2SC1778
C17 7P
C18 1000P
A

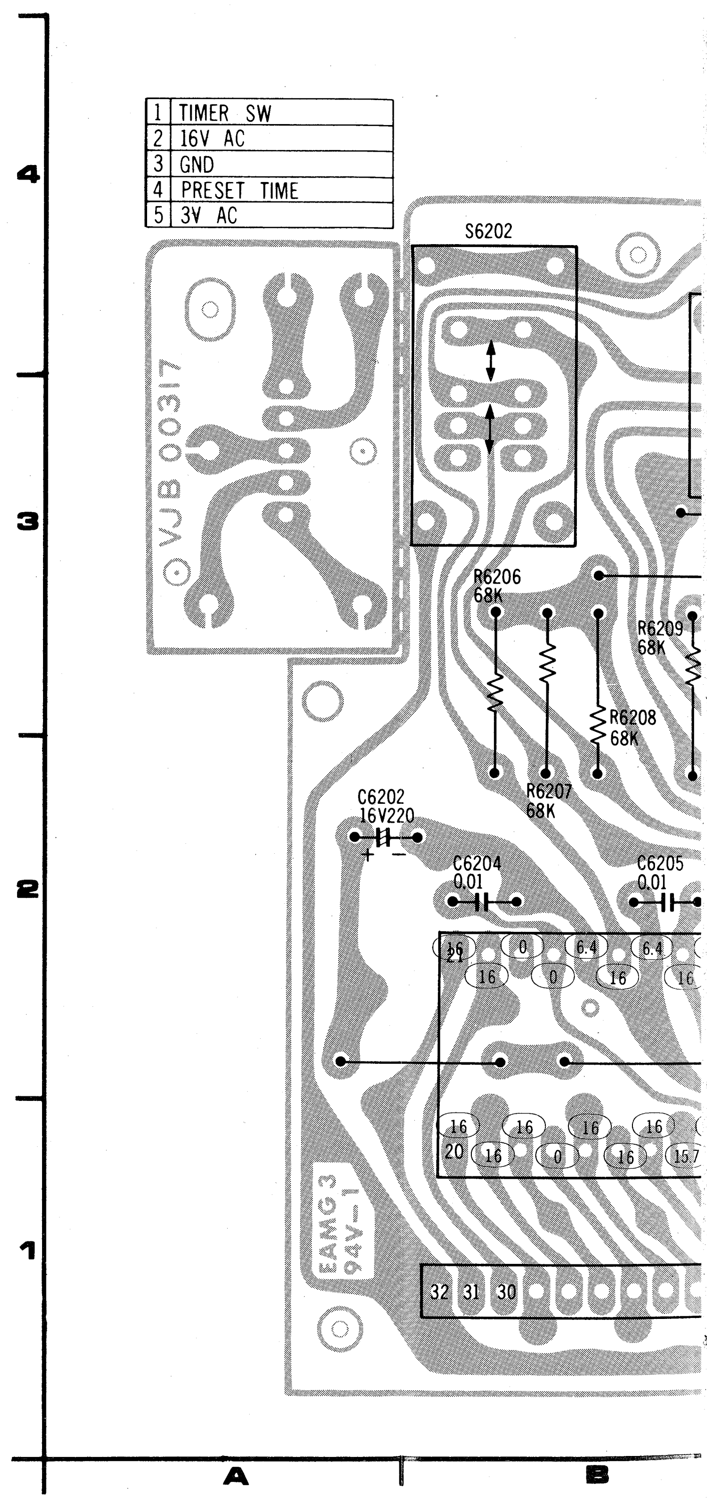
DIGITAL TIMER SCHEMATIC DIAGRAM

(Digital Timer C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	Timer SW	P62-2 (Reg. & Transport)
2	16V AC	P11-9 (Power Supply)
3	GND	P11-8 (Power Supply)
4	Preset Time	P62-1 (Reg. & Transport)
5	3V AC	P11-10 (Power Supply)


AM
PM
FILAMENT
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
IC6201
MN6076
1 AM 15.6
2 10H b&C 15.7
3 Hf -0.8
4 Hg 15.7
5 Ha 15.6
6 Hb 15.6
7 Hd 15.7
8 Hc -0.5
9 He 15.7
10 10Mf 15.7
11 10Mg 0
12 10Ma&d 15.8
13 10Mb 15.7
14 10Me 16
15 10Mc 16
16 Mf 16
17 Mg 0
18 Ma 16
19 Mb 16
20 Me 16
40 PM 1.5
39 1Hz
38 12/24 SELECT 6.4
37 BLANKING 6.4
36 50/60 SELECT 6.4
35 50/60 IN 11.2
34 FOWARD/REVERSE 6.3
33 SLOW 6.4
32 FAST 6.4
31 MS 1 6.4
30 MS 2 6.4
29 MS 3 16
28 Vss 16
27 VDD 6.4
26 TIMER OFF IN 16
25 TIMER ON IN 6.4
24 TIMER OUT 0
23 SLEEP OUT 0
22 Mc 16
21 Md 16
R6204 1K
Vss
VDD
GND
D6202 10EI
R6211 68K
R6210 68K
R6209 68K
R6208 68K
R6207 68K
C6205 0.01
R6206 68K
6204 0.01
R6205 68K
C6202 16V220
D6204 MA1130LF
R6202 27K
D6201 10EI
R6201 68K
R6203 680
C6201 25V470
C6203 0.01
1 TIMER SW
2 16V AC
3 GND
4 PRESET TIME
5 3V AC
AUTO START ③
AUTO STOP ②
TIME OF DAY ①
② ①
S6203
② ①
TIMER
① ON
② OFF
D6203 GL5AR2
S6206 (REV)
S6205 (SLOW)
S6204 (FAST)
S6202
4
3
2
1
A
B
C
D
E

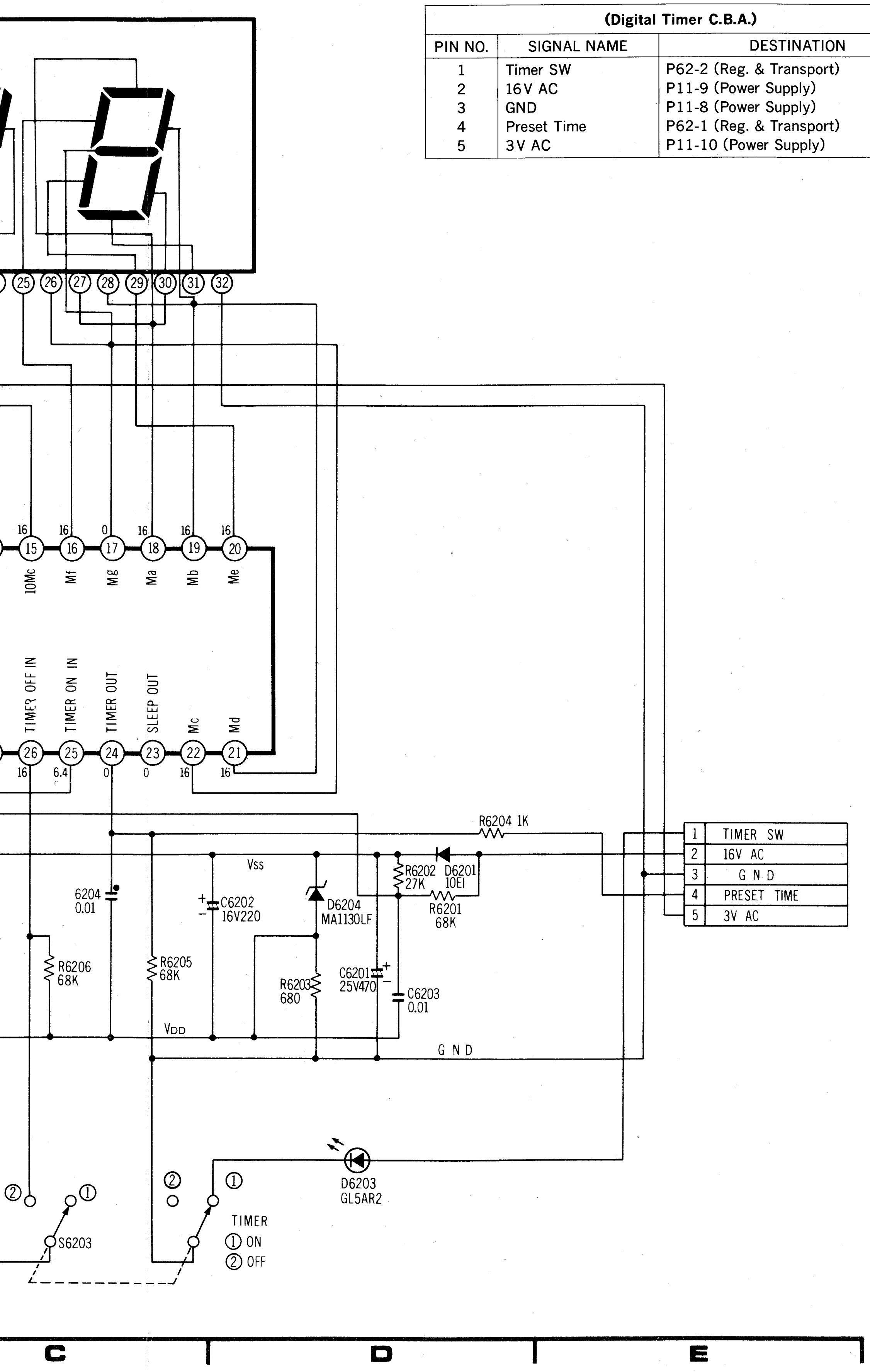
DIGITAL TIMER CIRCUIT

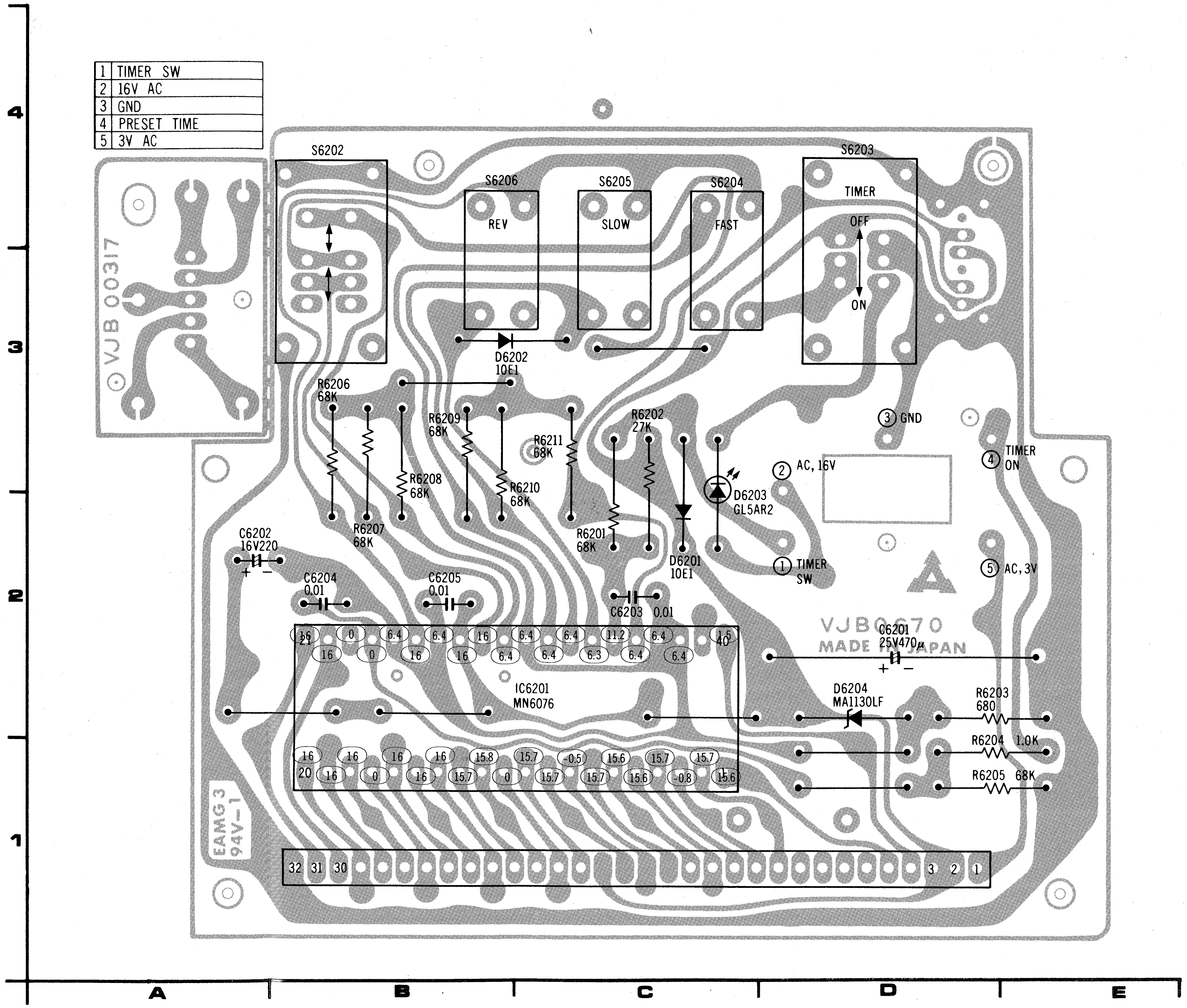

1 TIMER SW
2 16V AC
3 GND
4 PRESET TIME
5 3V AC
S6202
VJB 00317
R6206 68K
R6209 68K
R6208 68K
R6207 68K
C6202 16V220
C6204 0.01
C6205 0.01
EAMG 3 94V-1
32 31 30
4
3
2
1
A
B

DIGITAL TIMER CIRCUIT BOARD

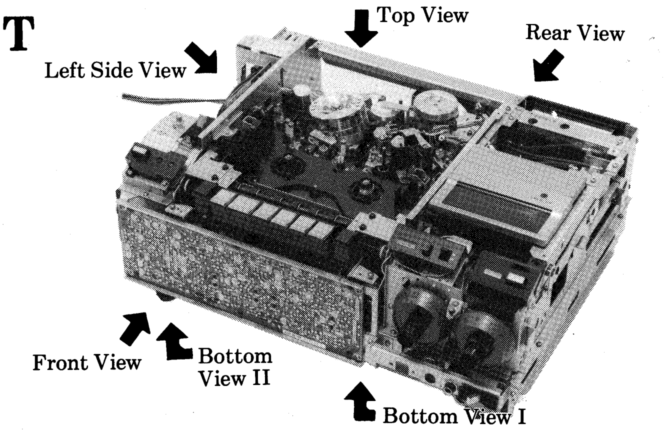
(Digital Timer C.B.A.)

PIN NO.	SIGNAL NAME	DESTINATION
1	Timer SW	P62-2 (Reg. & Transport)
2	16V AC	P11-9 (Power Supply)
3	GND	P11-8 (Power Supply)
4	Preset Time	P62-1 (Reg. & Transport)
5	3V AC	P11-10 (Power Supply)

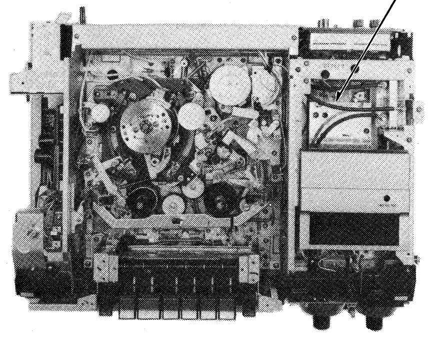

25 26 27 28 29 30 31 32
15 16 17 18 19 20
10Mc Mf Mg Ma Mb Me
TIMER OFF IN
TIMER ON IN
TIMER OUT
SLEEP OUT
Mc Md
26 25 24 23 22 21
R6204 1K
Vss
6204 0.01
C6202 16V220
D6204 MA1130LF
R6202 27K
D6201 10E1
R6201 68K
R6206 68K
R6205 68K
R6203 680
C6201 25V470
C6203 0.01
VDD
GND
1 TIMER SW
2 16V AC
3 GND
4 PRESET TIME
5 3V AC
D6203 GL5AR2
S6203
TIMER
① ON
② OFF
C D E


1 TIMER SW
2 16V AC
3 GND
4 PRESET TIME
5 3V AC
S6202
S6206 REV
S6205 SLOW
S6204 FAST
S6203 TIMER OFF ON
VJB 00317
D6202 10E1
R6206 68K
R6209 68K
R6211 68K
R6208 68K
R6210 68K
R6207 68K
R6202 27K
R6201 68K
D6201 10E1
D6203 GL5AR2
③ GND
② AC, 16V
④ TIMER ON
① TIMER SW
⑤ AC, 3V
C6202 16V220
C6204 0.01
C6205 0.01
C6203 0.01
C6201 25V470μ
VJB0670 MADE IN JAPAN
IC6201 MN6076
D6204 MA1130LF
R6203 680
R6204 1.0K
R6205 68K
EAMG 3 94V-1
32 31 30 3 2 1
4 3 2 1
A B C D E

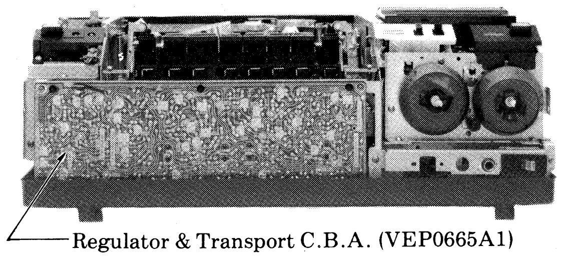
CIRCUIT BOARD LAYOUT


Top View
Rear View
Left Side View
Front View
Bottom View II
Bottom View I

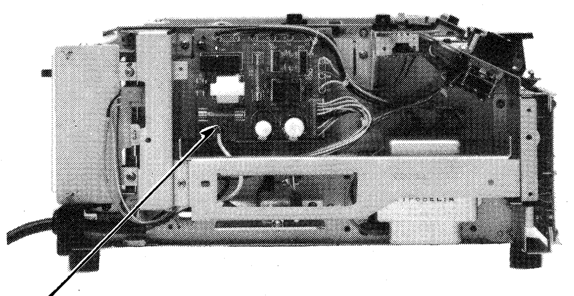
TOP VIEW


TV Demodulator C.B.A. (VEP0708A)

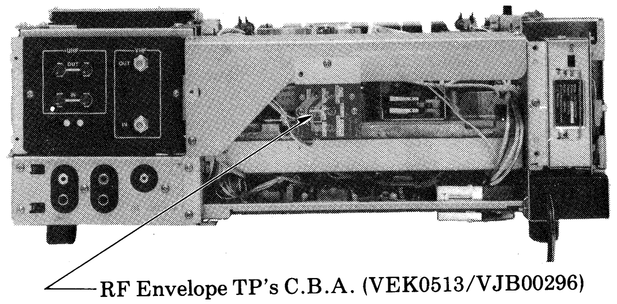
FRONT VIEW


Regulator & Transport C.B.A. (VEP0665A1)

LEFT SIDE VIEW


Power Supply C.B.A. (VEP0156A)

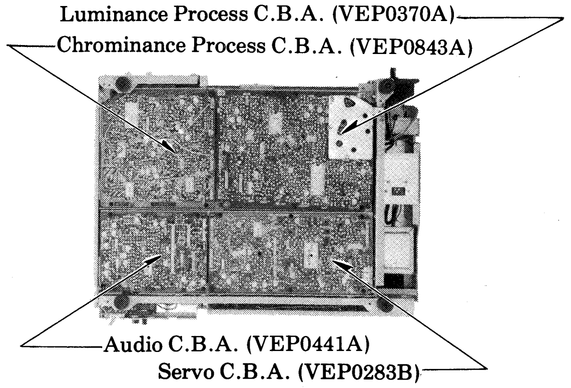
REAR VIEW


RF Envelope TP's C.B.A. (VEK0513/VJB00296)

BOTTOM VIEW I

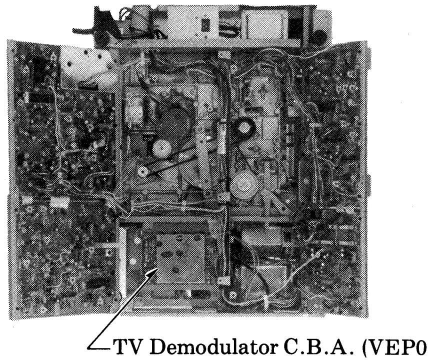
Luminance Process C.B.A. (VEP0370A)

Chrominance Process C.B.A. (VEP0843A)

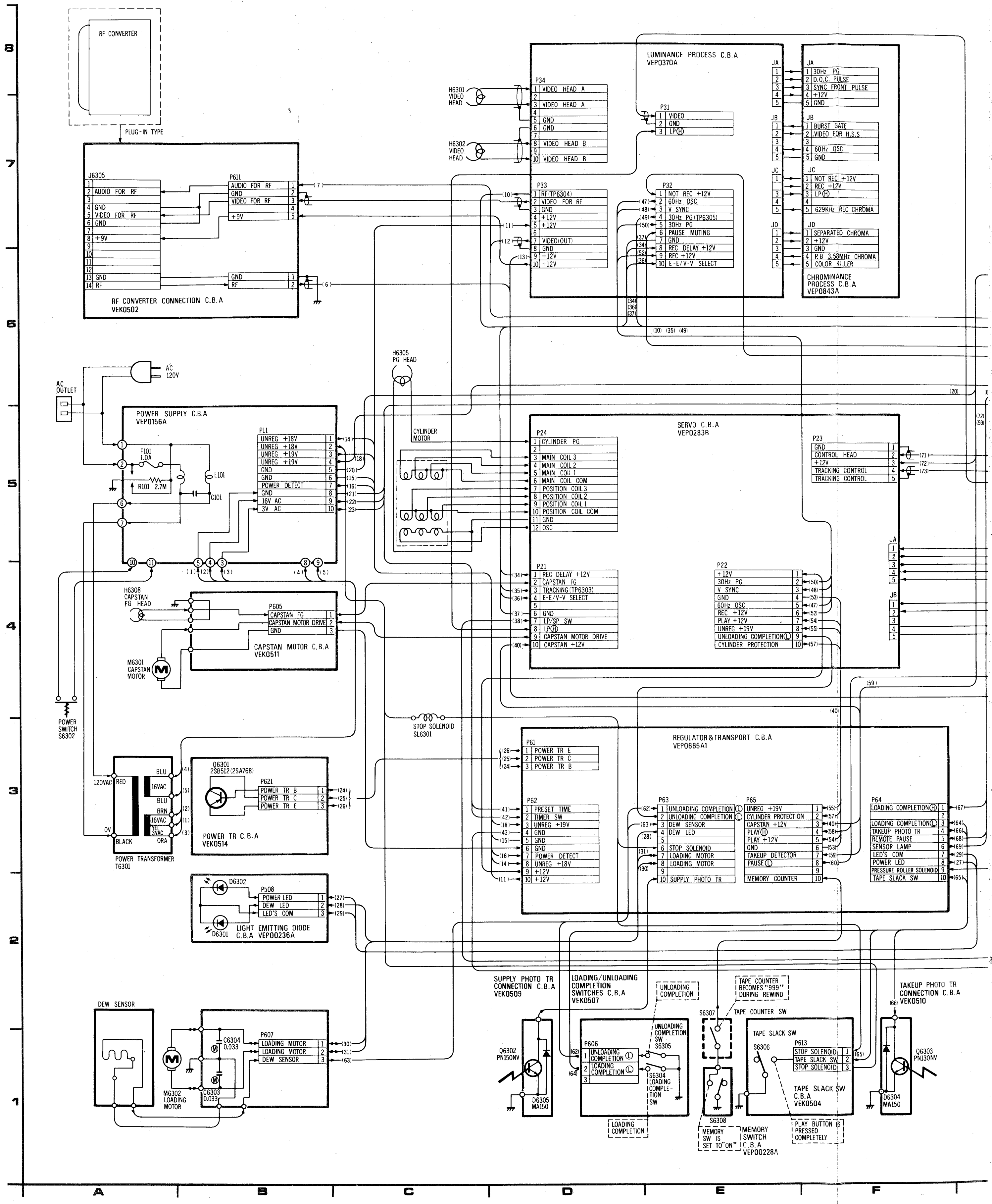

Audio C.B.A. (VEP0441A)

Servo C.B.A. (VEP0283B)

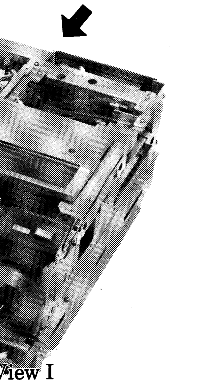
BOTTOM VIEW II


TV Demodulator C.B.A. (VEP0708A)

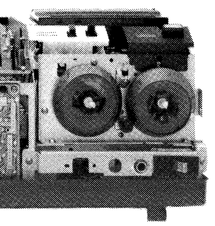
INTERCONNECTION SCHEMATIC DIAGRAM


8
7
6
5
4
3
2
1
A
B
C
D
E
F
RF CONVERTER
PLUG-IN TYPE
J6305
1
2 AUDIO FOR RF
3
4 GND
5 VIDEO FOR RF
6 GND
7
8 +9V
9
10
11
12
13 GND
14 RF
P611
AUDIO FOR RF 1
GND 2
VIDEO FOR RF 3
4
+9V 5
GND 1
RF 2
RF CONVERTER CONNECTION C.B.A
VEK0502
H6301 VIDEO HEAD
H6302 VIDEO HEAD
LUMINANCE PROCESS C.B.A
VEP0370A
P34
1 VIDEO HEAD A
2
3 VIDEO HEAD A
4
5 GND
6 GND
7
8 VIDEO HEAD B
9
10 VIDEO HEAD B
P31
1 VIDEO
2 GND
3 LP(H)
P33
1 RF(TP6304)
2 VIDEO FOR RF
3 GND
4 +12V
5 +12V
6
7 VIDEO(OUT)
8 GND
9 +12V
10 +12V
P32
1 NOT REC +12V
2 60Hz OSC
3 V SYNC
4 30Hz PG(TP6305)
5 30Hz PG
6 PAUSE MUTING
7 GND
8 REC DELAY +12V
9 REC +12V
10 E-E/V-V SELECT
JA
1 30Hz PG
2 D.O.C. PULSE
3 SYNC FRONT PULSE
4 +12V
5 GND
JB
1 BURST GATE
2 VIDEO FOR H.S.S
3
4 60Hz OSC
5 GND
JC
1 NOT REC +12V
2 REC +12V
3 LP(H)
4
5 629KHz REC CHROMA
JD
1 SEPARATED CHROMA
2 +12V
3 GND
4 P.B 3.58MHz CHROMA
5 COLOR KILLER
CHROMINANCE PROCESS C.B.A
VEP0843A
AC 120V
AC OUTLET
POWER SUPPLY C.B.A
VEP0156A
F101 1.0A
R101 2.7M
L101
C101
P11
UNREG +18V 1
UNREG +18V 2
UNREG +19V 3
UNREG +19V 4
GND 5
GND 6
POWER DETECT 7
GND 8
16V AC 9
3V AC 10
H6305 PG HEAD
CYLINDER MOTOR
H6308 CAPSTAN FG HEAD
P605
CAPSTAN FG 1
CAPSTAN MOTOR DRIVE 2
GND 3
CAPSTAN MOTOR C.B.A
VEK0511
M6301 CAPSTAN MOTOR
POWER SWITCH S6302
STOP SOLENOID SL6301
SERVO C.B.A
VEP0283B
P24
1 CYLINDER PG
2
3 MAIN COIL 3
4 MAIN COIL 2
5 MAIN COIL 1
6 MAIN COIL COM
7 POSITION COIL 3
8 POSITION COIL 2
9 POSITION COIL 1
10 POSITION COIL COM
11 GND
12 OSC
P23
GND 1
CONTROL HEAD 2
+12V 3
TRACKING CONTROL 4
TRACKING CONTROL 5
P21
1 REC DELAY +12V
2 CAPSTAN FG
3 TRACKING(TP6303)
4 E-E/V-V SELECT
5
6 GND
7 LP/SP SW
8 LP(H)
9 CAPSTAN MOTOR DRIVE
10 CAPSTAN +12V
P22
+12V 1
30Hz PG 2
V SYNC 3
GND 4
60Hz OSC 5
REC +12V 6
PLAY +12V 7
UNREG +19V 8
UNLOADING COMPLETION(L) 9
CYLINDER PROTECTION 10
JA
JB
120VAC
RED
0V
BLACK
BLU
16VAC
BLU
BRN
16VAC
YEL
3VAC
ORA
POWER TRANSFORMER T6301
Q6301 2SB512(2SA768)
P621
POWER TR B 1
POWER TR C 2
POWER TR E 3
POWER TR C.B.A
VEK0514
D6302
D6301
P508
POWER LED 1
DEW LED 2
LED'S COM 3
LIGHT EMITTING DIODE C.B.A VEP00236A
DEW SENSOR
M6302 LOADING MOTOR
C6304 0.033
C6303 0.033
P607
LOADING MOTOR 1
LOADING MOTOR 2
DEW SENSOR 3
REGULATOR & TRANSPORT C.B.A
VEP0665A1
P61
1 POWER TR E
2 POWER TR C
3 POWER TR B
P62
1 PRESET TIME
2 TIMER SW
3 UNREG +19V
4 GND
5 GND
6 GND
7 POWER DETECT
8 UNREG +18V
9 +12V
10 +12V
P63
1 UNLOADING COMPLETION(L)
2 UNLOADING COMPLETION(L)
3 DEW SENSOR
4 DEW LED
5
6 STOP SOLENOID
7 LOADING MOTOR
8 LOADING MOTOR
9
10 SUPPLY PHOTO TR
P65
UNREG +19V 1
CYLINDER PROTECTION 2
CAPSTAN +12V 3
PLAY(H) 4
PLAY +12V 5
GND 6
TAKEUP DETECTOR 7
PAUSE(L) 8
9
MEMORY COUNTER 10
P64
LOADING COMPLETION(H) 1
2
LOADING COMPLETION(L) 3
TAKEUP PHOTO TR 4
REMOTE PAUSE 5
SENSOR LAMP 6
LED'S COM 7
POWER LED 8
PRESSURE ROLLER SOLENOID 9
TAPE SLACK SW 10
SUPPLY PHOTO TR CONNECTION C.B.A
VEK0509
Q6302 PN150NV
D6305 MA150
LOADING/UNLOADING COMPLETION SWITCHES C.B.A
VEK0507
P606
1 UNLOADING COMPLETION (L)
2 LOADING COMPLETION (L)
3
UNLOADING COMPLETION
UNLOADING COMPLETION SW S6305
S6304 LOADING COMPLETION SW
LOADING COMPLETION
TAPE COUNTER BECOMES "999" DURING REWIND
S6307
TAPE COUNTER SW
S6308
MEMORY SW IS SET TO "ON"
MEMORY SWITCH C.B.A
VEP00228A
TAPE SLACK SW
S6306
P613
STOP SOLENOID 1
TAPE SLACK SW 2
STOP SOLENOID 3
TAPE SLACK SW C.B.A
VEK0504
PLAY BUTTON IS PRESSED COMPLETELY
TAKEUP PHOTO TR CONNECTION C.B.A
VEK0510
Q6303 PN130NV
D6304 MA150

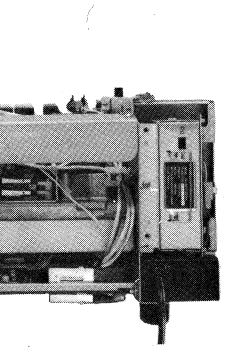
Rear View



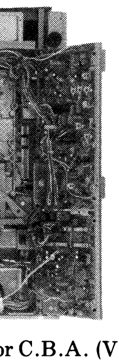
View I



A. (VEP0665A1)

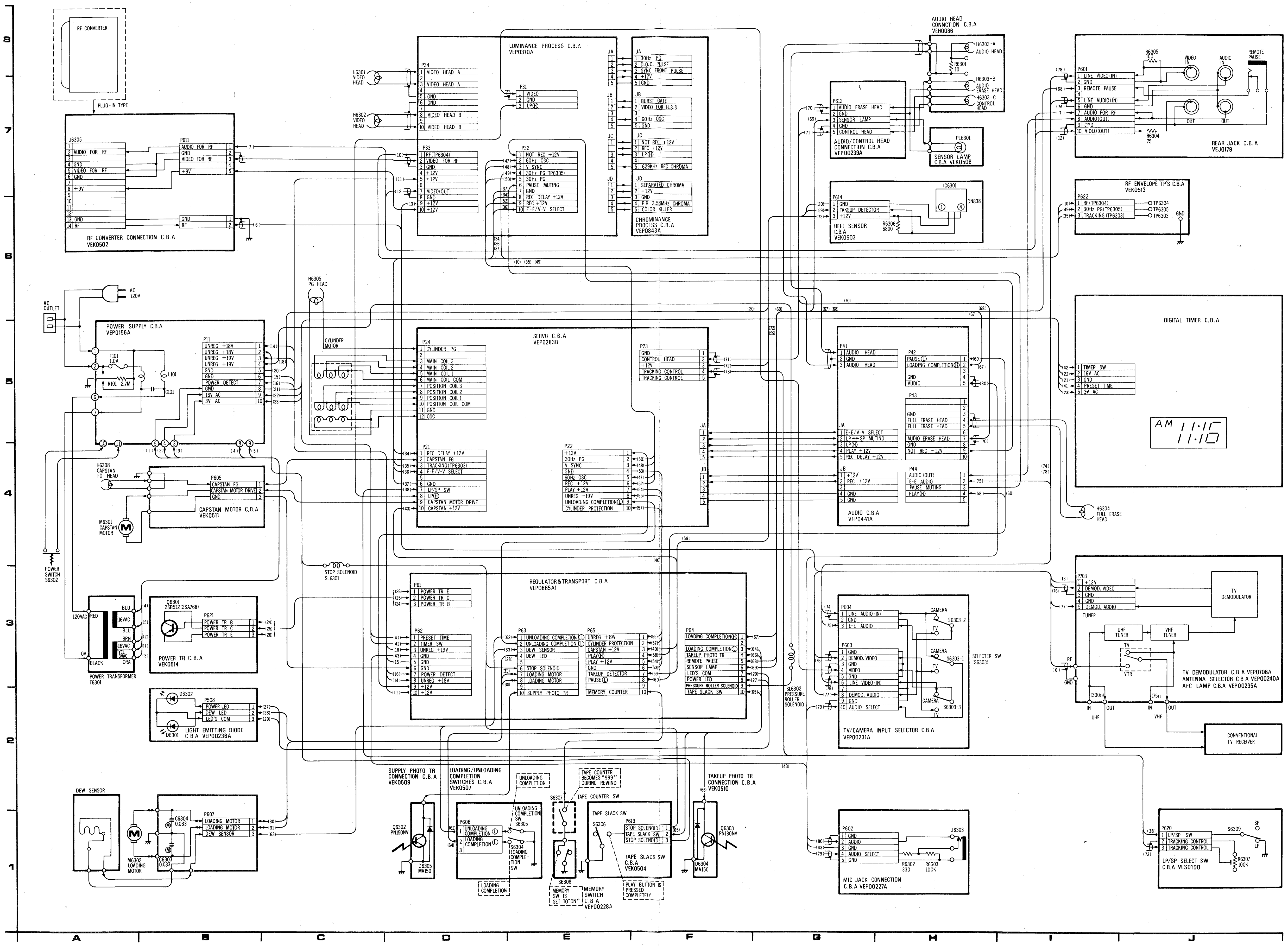


EK0513/VJB00296)



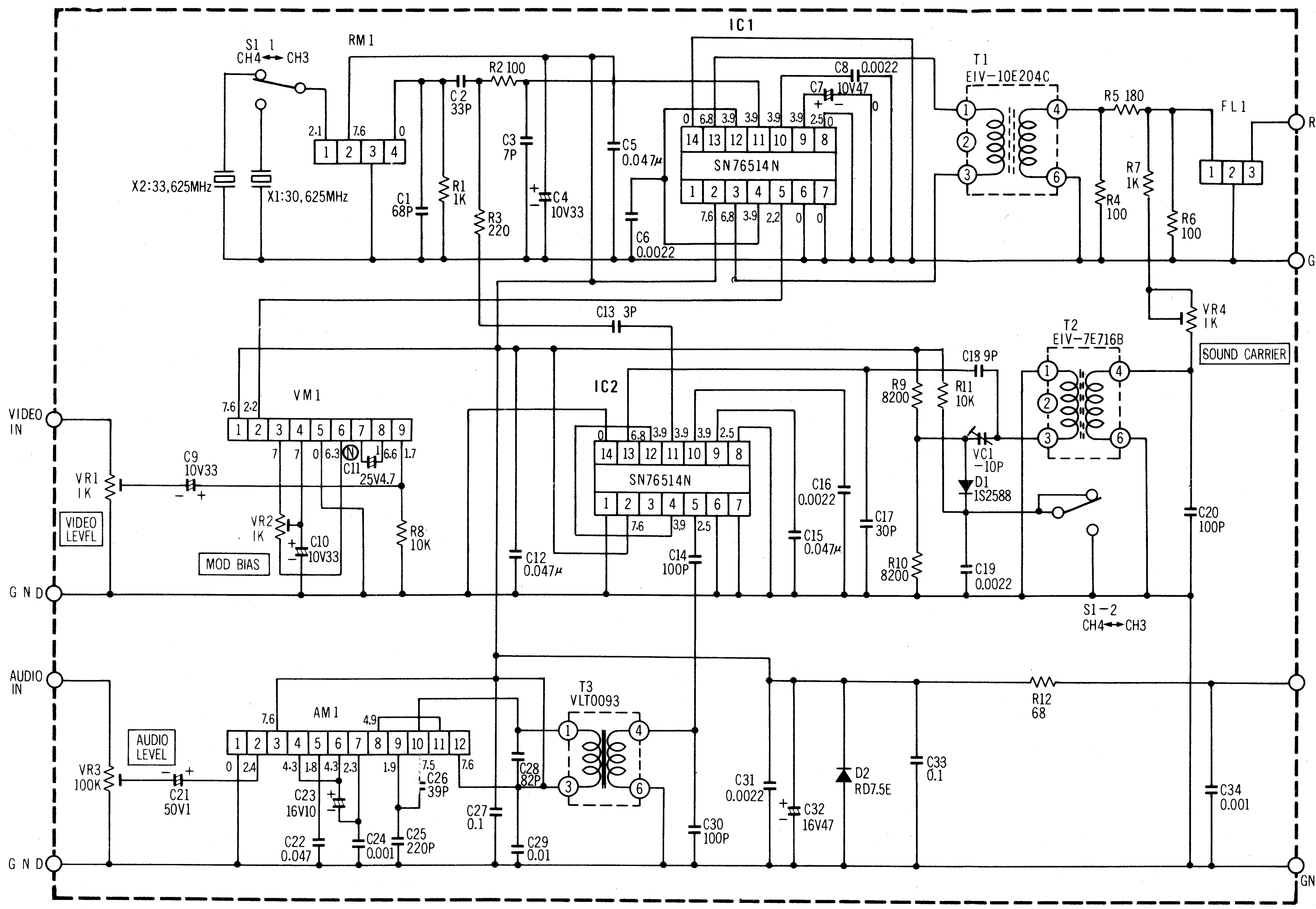
or C.B.A. (VEP0708A)

INTERCONNECTION SCHEMATIC DIAGRAM

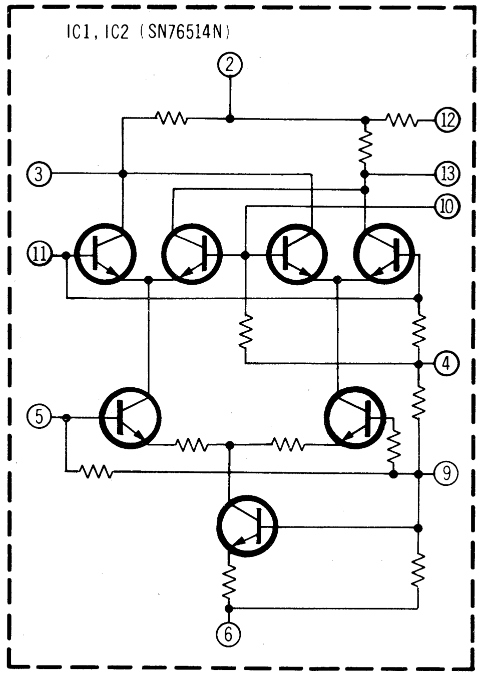


RF CONVERTER
PLUG-IN TYPE
RF CONVERTER CONNECTION C.B.A VEK0502
LUMINANCE PROCESS C.B.A VEP0370A
CHROMINANCE PROCESS C.B.A VEP0843A
H6301 VIDEO HEAD
H6302 VIDEO HEAD
AUDIO HEAD CONNECTION C.B.A VEH0086
H6303-A AUDIO HEAD
H6303-B AUDIO ERASE HEAD
H6303-C CONTROL HEAD
AUDIO/CONTROL HEAD CONNECTION C.B.A VEP00239A
PL6301
SENSOR LAMP C.B.A VEK0506
REEL SENSOR C.B.A VEK0503
IC6301 DN838
REAR JACK C.B.A VEJ0179
VIDEO IN
AUDIO IN
REMOTE PAUSE
OUT
RF ENVELOPE TP'S C.B.A VEK0513
TP6304
TP6305
TP6303
GND
AC OUTLET
AC 120V
POWER SUPPLY C.B.A VEP0156A
F101 1.0A
R101 2.7M
C101
H6305 PG HEAD
CYLINDER MOTOR
SERVO C.B.A VEP0283B
AUDIO C.B.A VEP0441A
DIGITAL TIMER C.B.A
AM 11:15
11:16
H6304 FULL ERASE HEAD
H6308 CAPSTAN FG HEAD
CAPSTAN MOTOR C.B.A VEK0511
M6301 CAPSTAN MOTOR
POWER SWITCH S6302
STOP SOLENOID SL6301
REGULATOR&TRANSPORT C.B.A VEP0665A1
Q6301 2SB512(2SA768)
POWER TR C.B.A VEK0514
120VAC
16VAC
BLU
RED
BRN
BLACK
ORA
0V
POWER TRANSFORMER T6301
D6302
D6301
LIGHT EMITTING DIODE C.B.A VEP00236A
SL6302 PRESSURE ROLLER SOLENOID
TV/CAMERA INPUT SELECTOR C.B.A VEP00231A
CAMERA
TV
S6303-2
S6303-1
S6303-3
SELECTER SW (S6303)
TV DEMODULATOR
TUNER
UHF TUNER
VHF TUNER
VTR
UHF
VHF
IN
OUT
RF
GND
TV DEMODULATOR C.B.A VEP0708A
ANTENNA SELECTOR C.B.A VEP00240A
AFC LAMP C.B.A VEP00235A
CONVENTIONAL TV RECEIVER
DEW SENSOR
M6302 LOADING MOTOR
C6304 0.033
C6303 0.033
SUPPLY PHOTO TR CONNECTION C.B.A VEK0509
Q6302 PN150NV
D6305 MA150
LOADING/UNLOADING COMPLETION SWITCHES C.B.A VEK0507
UNLOADING COMPLETION
LOADING COMPLETION
S6305
S6304
TAPE COUNTER BECOMES "999" DURING REWIND
TAPE COUNTER SW
S6307
S6308
MEMORY SW IS SET TO "ON"
MEMORY SWITCH C.B.A VEP00228A
TAPE SLACK SW
S6306
TAPE SLACK SW C.B.A VEK0504
PLAY BUTTON IS PRESSED COMPLETELY
TAKEUP PHOTO TR CONNECTION C.B.A VEK0510
Q6303 PN130NV
D6304 MA150
MIC JACK CONNECTION C.B.A VEP00227A
J6303
R6302 330
R6303 100K
LP/SP SELECT SW C.B.A VES0100
S6309
SP
LP
R6307 100K
A
B
C
D
E
F
G
H
I
J
8
7
6
5
4
3
2
1

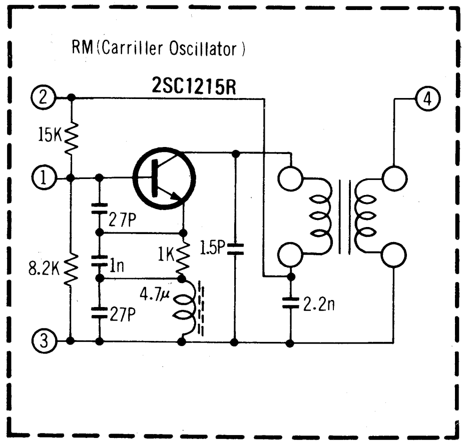
RF CONVERTER SCHEMATIC DIAGRAM



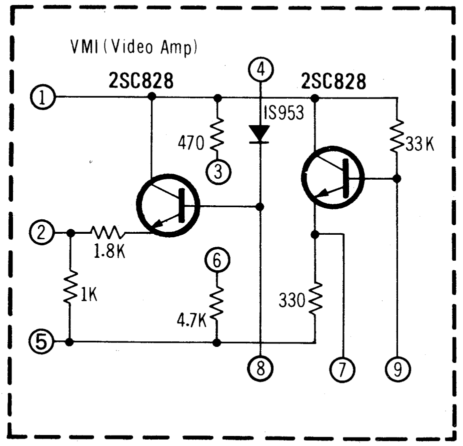
IC1
SN76514N
IC2
SN76514N
S1-1 CH4 ↔ CH3
RM1
X2:33,625MHz
X1:30,625MHz
R2 100
C2 33P
C1 68P
R1 1K
R3 220
C3 7P
C4 10V33
C5 0.047μ
C6 0.0022
C8 0.0022
C7 10V47
T1 EIV-10E204C
R5 180
R4 100
R7 1K
R6 100
FL1
RF OUT
GND
C13 3P
VR4 1K
SOUND CARRIER
T2 EIV-7E716B
C18 9P
R9 8200
R11 10K
VC1 -10P
D1 1S2588
R10 8200
C19 0.0022
S1-2 CH4 ↔ CH3
C20 100P
VIDEO IN
VR1 1K
VIDEO LEVEL
C9 10V33
VM1
VR2 1K
C10 10V33
C11 25V4.7
MOD BIAS
R8 10K
C12 0.047μ
C16 0.0022
C17 30P
C15 0.047μ
C14 100P
GND
AUDIO IN
VR3 100K
AUDIO LEVEL
C21 50V1
AM1
C23 16V10
C22 0.047
C24 0.001
C25 220P
C26 39P
C27 0.1
C28 82P
C29 0.01
T3 VLT0093
C30 100P
C31 0.0022
C32 16V47
D2 RD7.5E
C33 0.1
R12 68
C34 0.001
GND



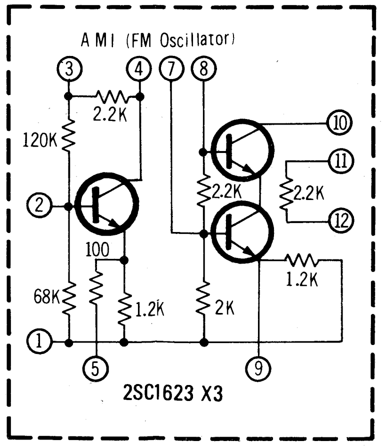
IC1, IC2 (SN76514N)
②
③
⑪
⑫
⑬
⑩
④
⑤
⑨
⑥



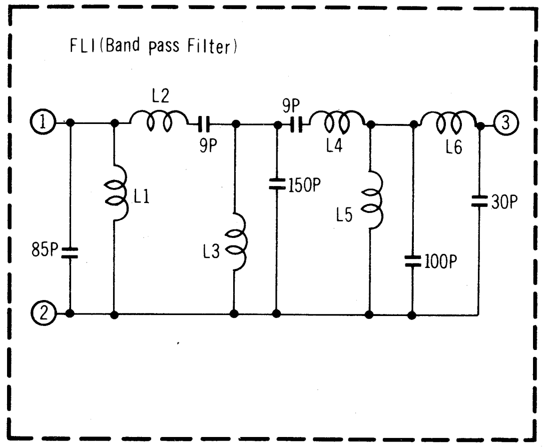
RM (Carriller Oscillator)
2SC1215R
15K
8.2K
27P
1n
27P
1K
4.7μ
1.5P
2.2n
①
②
③
④



VMI (Video Amp)
2SC828
2SC828
IS953
470
33K
1.8K
1K
4.7K
330
①
②
③
④
⑤
⑥
⑦
⑧
⑨

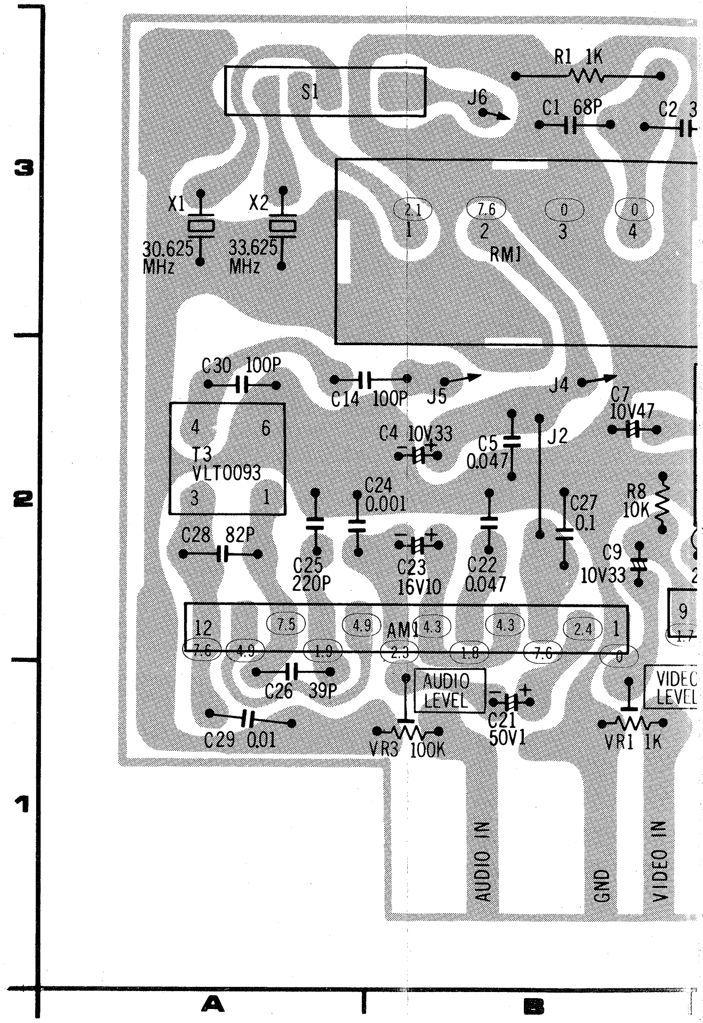


AMI (FM Oscillator)
2.2K
120K
100
68K
1.2K
2.2K
2.2K
2K
1.2K
2SC1623 X3
①
②
③
④
⑤
⑦
⑧
⑨
⑩
⑪
⑫



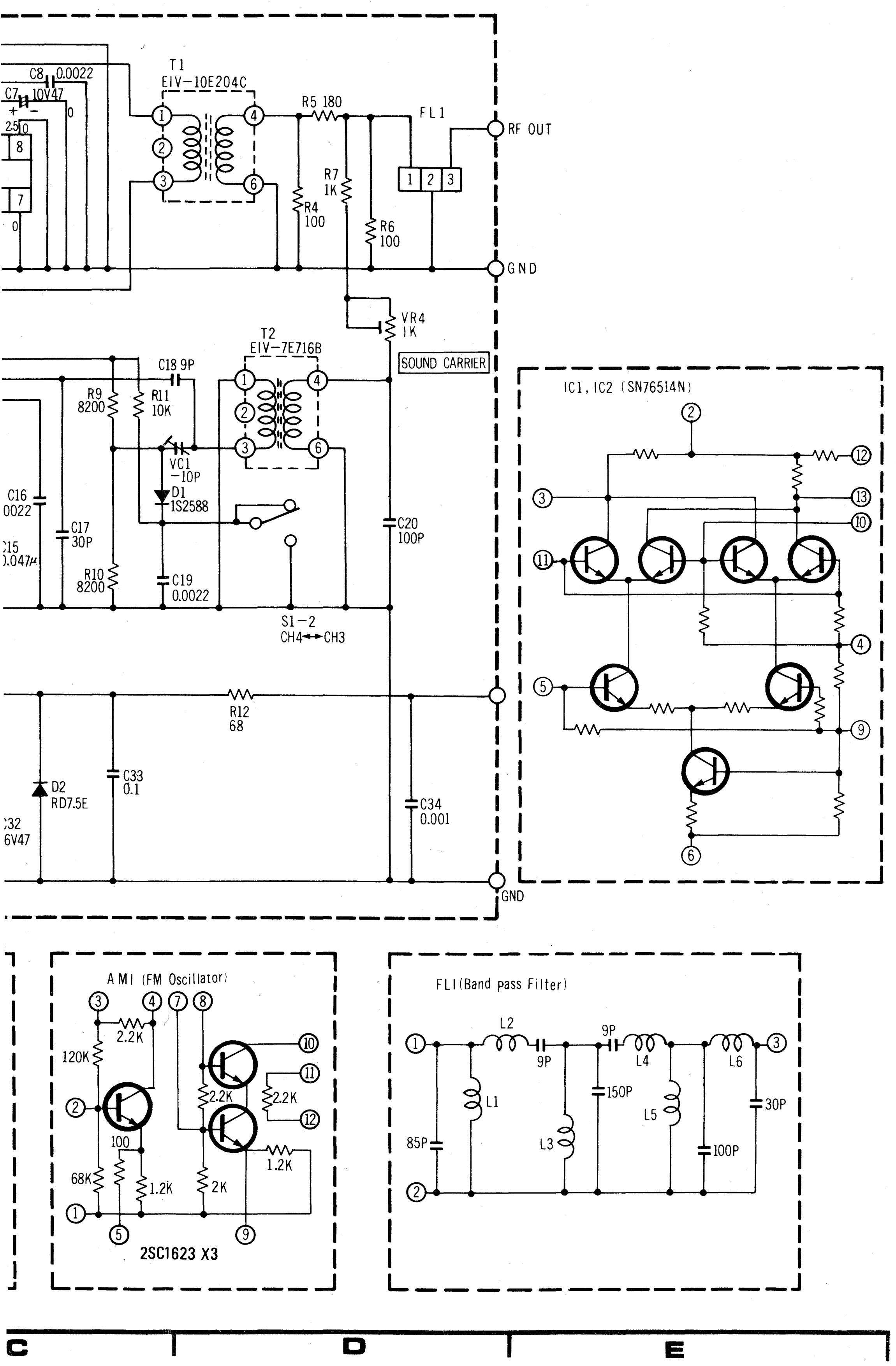
FL1 (Band pass Filter)
L2
9P
9P
L4
L6
L1
L3
85P
150P
L5
100P
30P
①
②
③

RF CONVERTER CIRCU



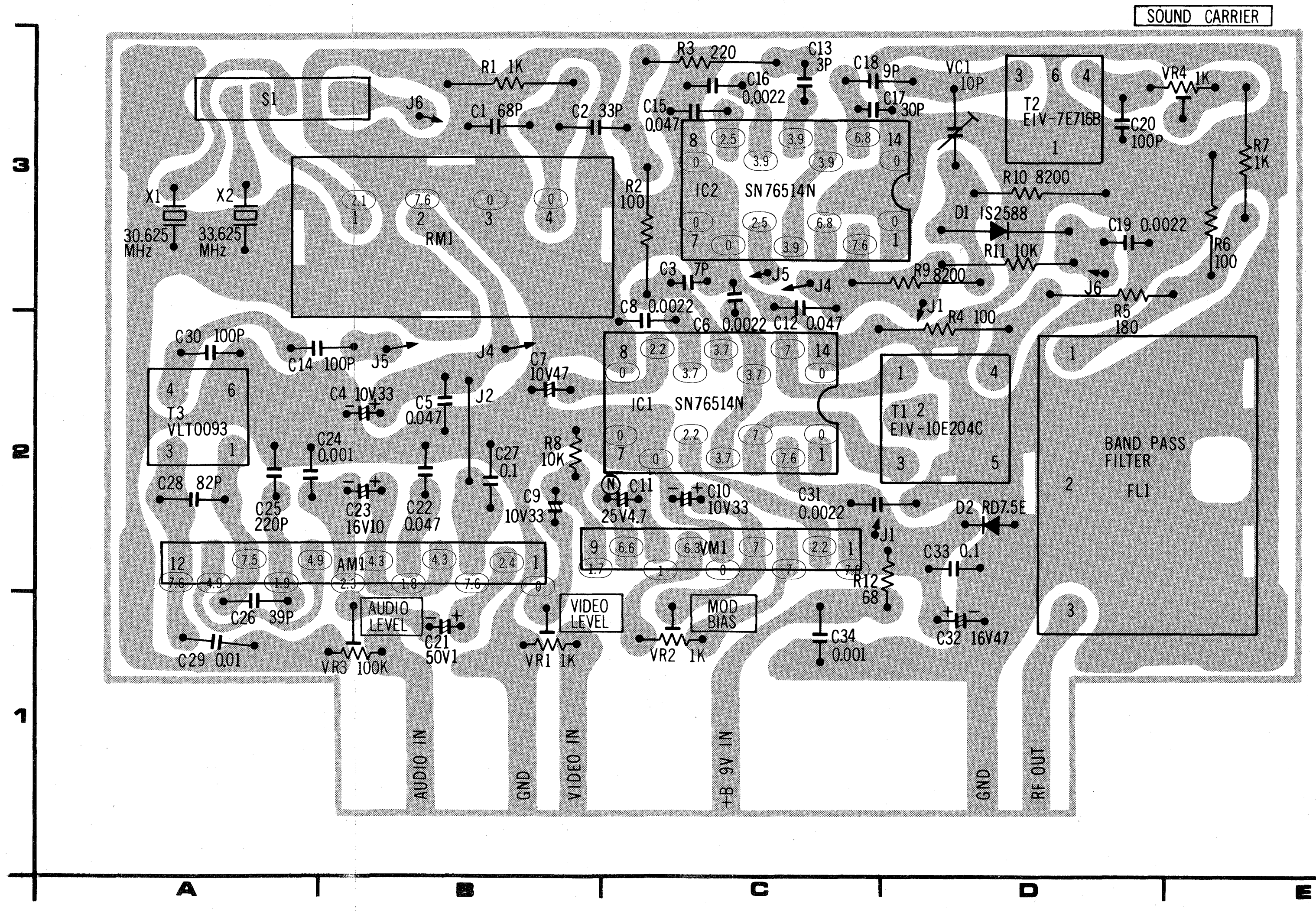
S1
R1 1K
J6
C1 68P
C2
X1
X2
30.625 MHz
33.625 MHz
RM1
C30 100P
C14 100P
J5
J4
C7 10V47
T3 VLT0093
C4 10V33
C5 0.047
J2
C24 0.001
C28 82P
C25 220P
C23 16V10
C22 0.047
C27 0.1
R8 10K
C9 10V33
AM1
C26 39P
AUDIO LEVEL
C21 50V1
VIDEO LEVEL
C29 0.01
VR3 100K
VR1 1K
AUDIO IN
GND
VIDEO IN
3
2
1
A
B

M



T1
EIV-10E204C
C8 0.0022
C7 10V47
R5 180
FL1
RF OUT
GND
R7 1K
R4 100
R6 100
VR4 1K
SOUND CARRIER
T2
EIV-7E716B
C18 9P
R9 8200
R11 10K
VC1 -10P
D1 1S2588
C16 0.0022
C17 30P
C15 0.047μ
R10 8200
C19 0.0022
C20 100P
S1-2
CH4←→CH3
R12 68
D2 RD7.5E
C33 0.1
C34 0.001
C32 16V47
IC1, IC2 (SN76514N)
AMI (FM Oscillator)
2.2K
120K
100
68K
1.2K
2K
2SC1623 X3
FL1(Band pass Filter)
L1
L2
L3
L4
L5
L6
9P
150P
85P
100P
30P
C
D
E

RF CONVERTER CIRCUIT BOARD



SOUND CARRIER
S1
R1 1K
R3 220
C13 3P
C18 9P
VC1 10P
C16 0.0022
C17 30P
C1 68P
C2 33P
C15 0.047
T2 EIV-7E716B
C20 100P
VR4 1K
R7 1K
X1 30.625 MHz
X2 33.625 MHz
RM1
R2 100
IC2 SN76514N
R10 8200
D1 1S2588
R11 10K
C19 0.0022
R6 100
R9 8200
C3 7P
C8 0.0022
C6 0.0022
C12 0.047
J1 J2 J4 J5 J6
R4 100
R5 180
C30 100P
C14 100P
C4 10V33
C5 0.047
C7 10V47
T3 VLT0093
IC1 SN76514N
T1 EIV-10E204C
BAND PASS FILTER FL1
C28 82P
C24 0.001
C25 220P
C23 16V10
C22 0.047
C27 0.1
C9 10V33
R8 10K
C11 25V4.7
C10 10V33
C31 0.0022
D2 RD7.5E
C33 0.1
R12 68
AM1
VM1
C26 39P
AUDIO LEVEL
VIDEO LEVEL
MOD BIAS
C21 50V1
C29 0.01
VR3 100K
VR1 1K
VR2 1K
C34 0.001
C32 16V47
AUDIO IN
GND
VIDEO IN
+B 9V IN
GND
RF OUT
1
2
3
A
B
C
D
E

J6305

1	
2	AUDIO FOR RF
3	
4	GND
5	VIDEO FOR RF
6	GND
7	
8	+9V
9	
10	
11	
12	
13	GND
14	RF

ORDER NO. VRD-7810-303

Service Manual

Video Cassette Recorder

Panasonic
Omnivision IV VHS™

PV-1100

Vol. 4

Exploded Views
Replacement Parts List

SPECIFICATIONS

Power Source: 120VAC ± 10%, 60Hz ± 0.5%
Power Consumption: Approx. 29 watts
Television System: EIA Standard (525 lines, 60 fields)
NTSC color signal
Video Recording System: 2 rotary heads helical scanning system
Luminance: FM azimuth recording
Chrominance: Converted subcarrier phase shift recording
Audio Track: 1 track
Tape Format: Tape width 1/2″ (12.7mm), high density tape
Tape Speed: SP mode: 1-5/16 i.p.s (33.35mm/s)
LP mode: 21/32 i.p.s (16.67mm/s)
Record/Playback Time: 1 or 2 hours with NV-T60
2 or 4 hours with NV-T120
FF/REW Time: Less than 4.5 min with NV-T120
Heads: Video: 2 rotary heads
Audio/Control: 1 stationary head
Erase: 1 full track
1 audio track erase for audio dubbing
Input Level: Video: Video IN Connector (RCA type)
1.0Vp-p, 75Ω unbalanced
Audio: MIC Jack (1/4″ PHONO JACK)
−70dB, 600Ω unbalanced
Audio IN Jack (RCA type)
−20dB, 100kΩ unbalanced
TV Tuners: VHF Input: VHF Ch2-Ch13,
65−90dBμ, 75Ω unbalanced
UHF Input: UHF Ch14-Ch83,
65−90dBμ, 300Ω balanced
Output Level: Video: Video OUT Connector (RCA type)
1.0Vp-p, 75Ω unbalanced
Audio: Audio OUT Jack (RCA type)
−6dB, 600Ω unbalanced
RF Modulated: Ch3/Ch4 switchable,
72dBμ, 75Ω unbalanced
Video Horizontal Resolution: Color: more than 230 lines
B/W: more than 270 lines
Signal-to-Noise Ratio: Video: SP mode: better than 40dB
LP mode: better than 40dB
(Rohde & Schwarz noise meter)
Audio: SP mode: better than 42dB
LP mode: better than 40dB
Operation Temperature: 41°F−104°F (5°C−40°C)
Operating Humidity: 10%−75%
Weight: 35.3/4lbs (16.3kg)
Dimensions: 19-1/8″(W) × 15-1/2(D) × 6-7/8(H)
(485mm × 394mm × 175mm)
Accessories Supplied:
- Blank tape
- Remote control unit
- 75Ω −300Ω matching transformer
- 300Ω −75Ω matching transformer
- Coaxial cable (5ft)
- F type connectors
- Twin lead wire (5ft)
- Dust cover
- Terminal Block

Available Tapes: 1/2″ VHS video cassette tapes
NV-T120 Approx. 810ft. (247m), 2 or 4 hrs.
NV-T60 Approx. 417ft. (127m), 1 or 2 hrs.

Weight and dimensions shown are approximate. Specifications are subject to change without notice.

Panasonic®

Panasonic Company
Division of Matsushita Electric
Corporation of America
One Panasonic Way, Secaucus,
New Jersey 07094

Panasonic Hawaii, Inc.
320 Waiakamilo Road, Honolulu,
Hawaii 96817

Matsushita Electric of Canada Limited
40 Ronson Drive, Rexdale,
Ontario, Canada, M9W 1B5

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  5. Chassis Parts Section-(2) 4-8
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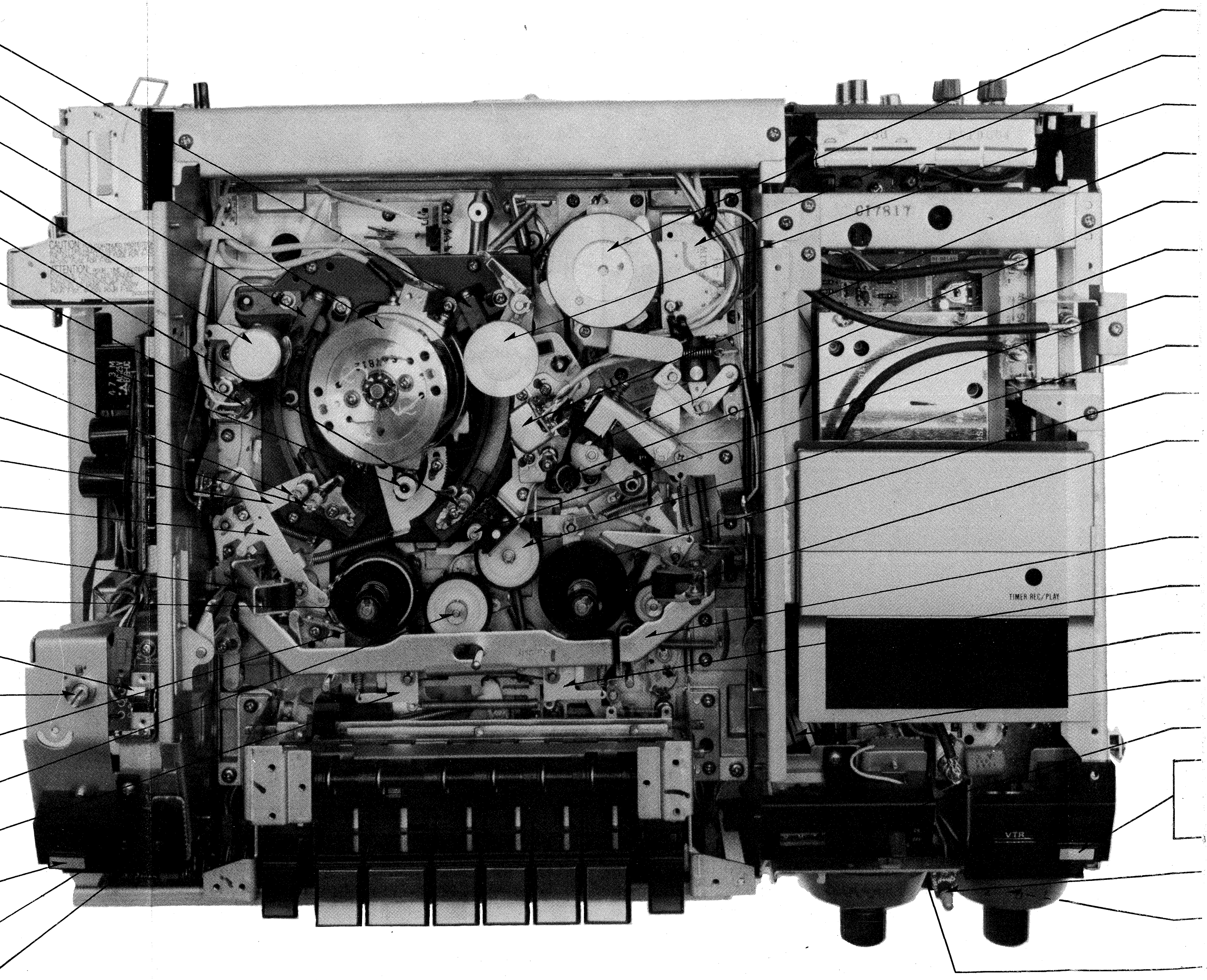
  9. Casing Parts Section 4-12
  10. Packing Parts Section 4-13
REPLACEMENT PARTS LIST 4-14
  Mechanical Replacement Parts List .... 4-14—4-23
  Electrical Replacement Parts List .... 4-24—4-46

INNER PARTS LOCATION

TOP VIEW



Lock Base B Unit VXK0271

Upper Cylinder Unit VEH0070

Lock Base A Unit VXK0258

Inertia Roller Arm Unit VXP0197

Loading Post (R) Unit VXA0794

Full Erase Head VBS0014

Cassette Support VMX0121

Roller Post Unit VXA0743

Loading Post (L) Unit VXA0795

Threading Arm Unit VXL0465

Tension Arm Unit VXL0467

Cassette Arm B Unit VXL0530

Supply Reel Table Unit VXR0064

SP/LP Select Switch VST0017

Tracking Control EVHR7AK15B15

Tension Band Unit VXZ0047

Rewind Roller Unit VXP0171

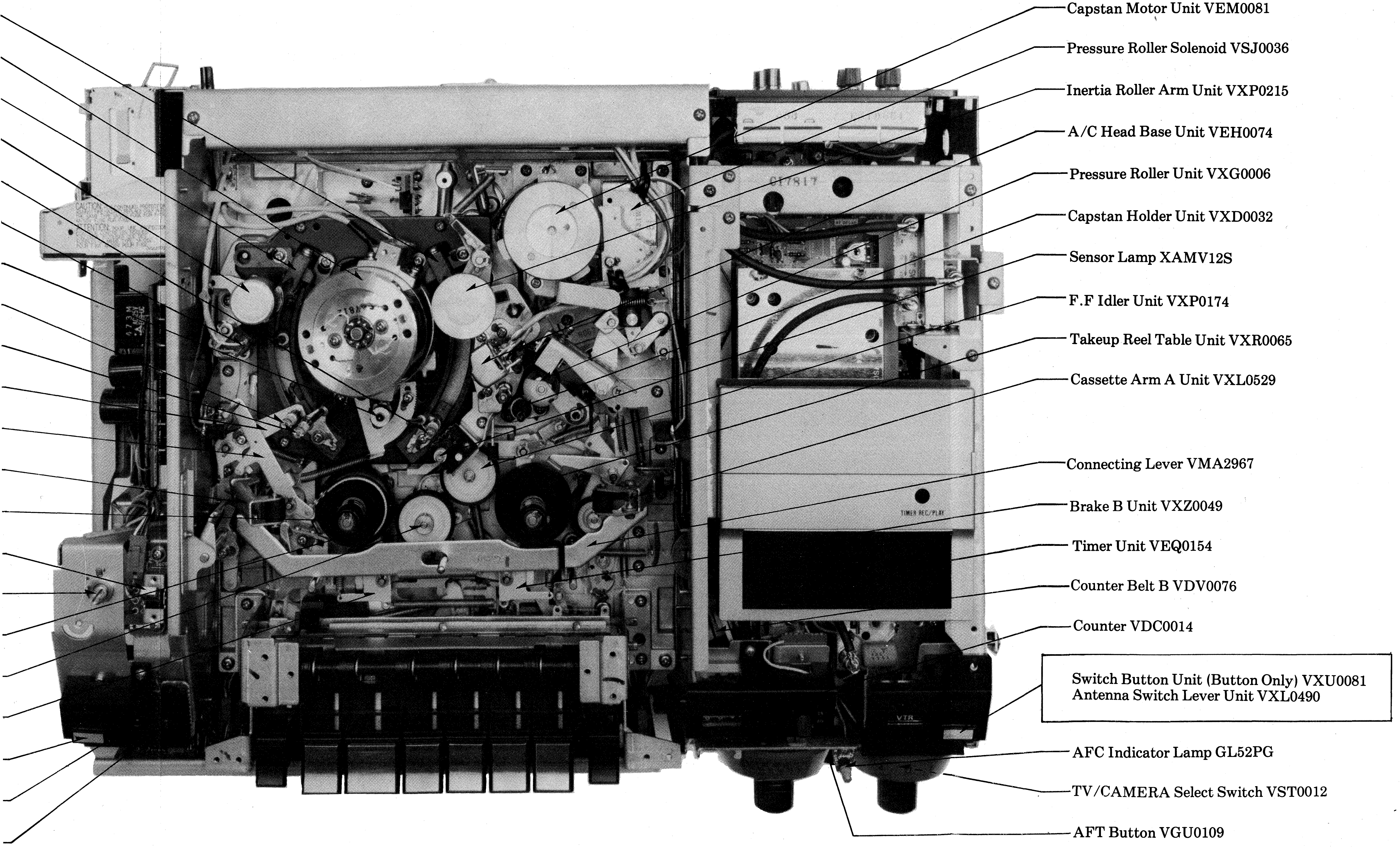
Brake A Unit VXZ0048

Switch Button Unit (Button Only) VXU0081

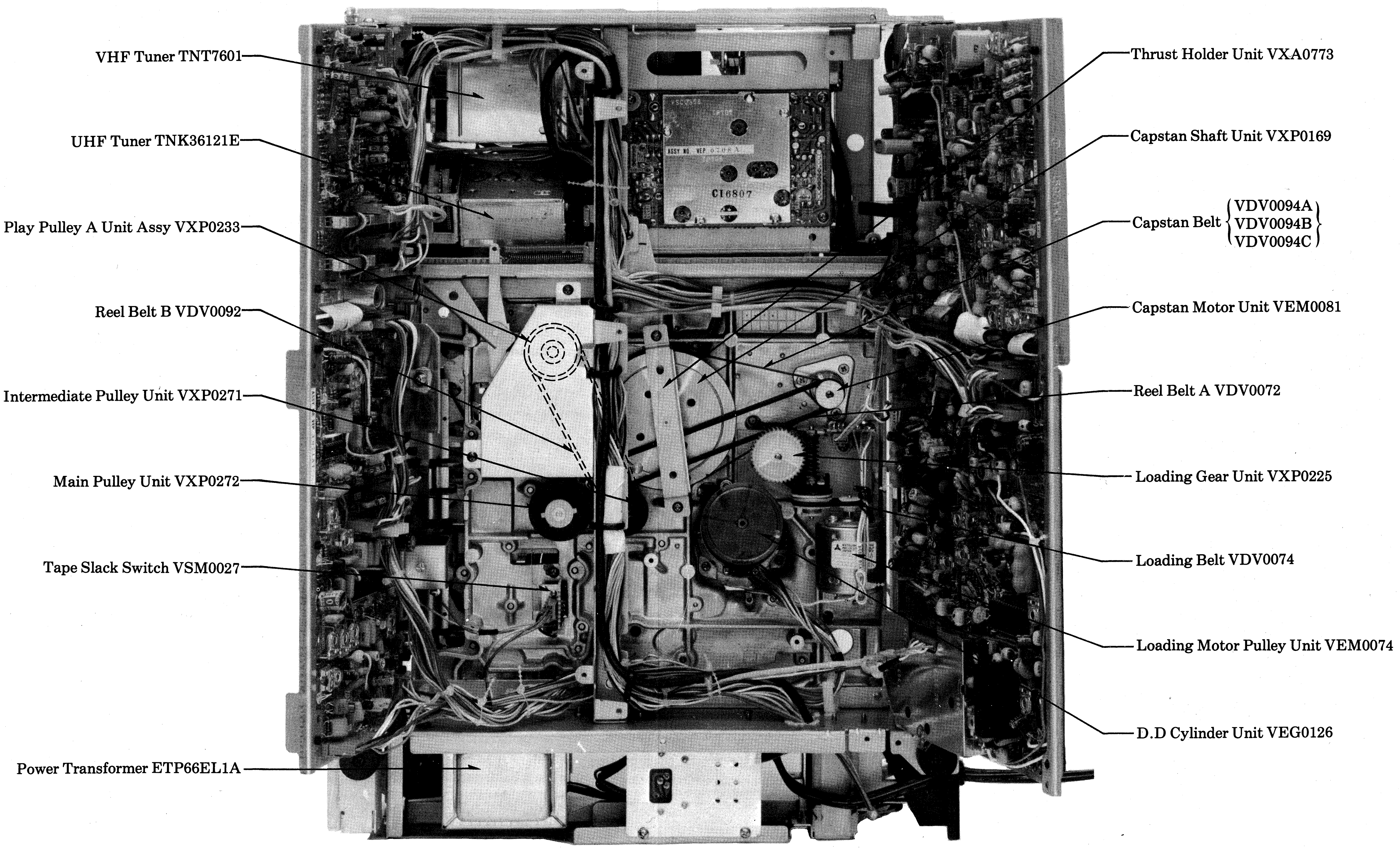
Power Indicator Lamp GL52AR

Dew Indicator Lamp GL52AY

N


Capstan Motor Unit VEM0081
Pressure Roller Solenoid VSJ0036
Inertia Roller Arm Unit VXP0215
A/C Head Base Unit VEH0074
Pressure Roller Unit VXG0006
Capstan Holder Unit VXD0032
Sensor Lamp XAMV12S
F.F Idler Unit VXP0174
Takeup Reel Table Unit VXR0065
Cassette Arm A Unit VXL0529
Connecting Lever VMA2967
Brake B Unit VXZ0049
Timer Unit VEQ0154
Counter Belt B VDV0076
Counter VDC0014
Switch Button Unit (Button Only) VXU0081
Antenna Switch Lever Unit VXL0490
AFC Indicator Lamp GL52PG
TV/CAMERA Select Switch VST0012
AFT Button VGU0109
TIMER REC/PLAY
VTR

BOTTOM VIEW


VHF Tuner TNT7601
UHF Tuner TNK36121E
Play Pulley A Unit Assy VXP0233
Reel Belt B VDV0092
Intermediate Pulley Unit VXP0271
Main Pulley Unit VXP0272
Tape Slack Switch VSM0027
Power Transformer ETP66EL1A
Thrust Holder Unit VXA0773
Capstan Shaft Unit VXP0169
Capstan Belt {VDV0094A VDV0094B VDV0094C}
Capstan Motor Unit VEM0081
Reel Belt A VDV0072
Loading Gear Unit VXP0225
Loading Belt VDV0074
Loading Motor Pulley Unit VEM0074
D.D Cylinder Unit VEG0126
CI6807

EXPLODED VIEW

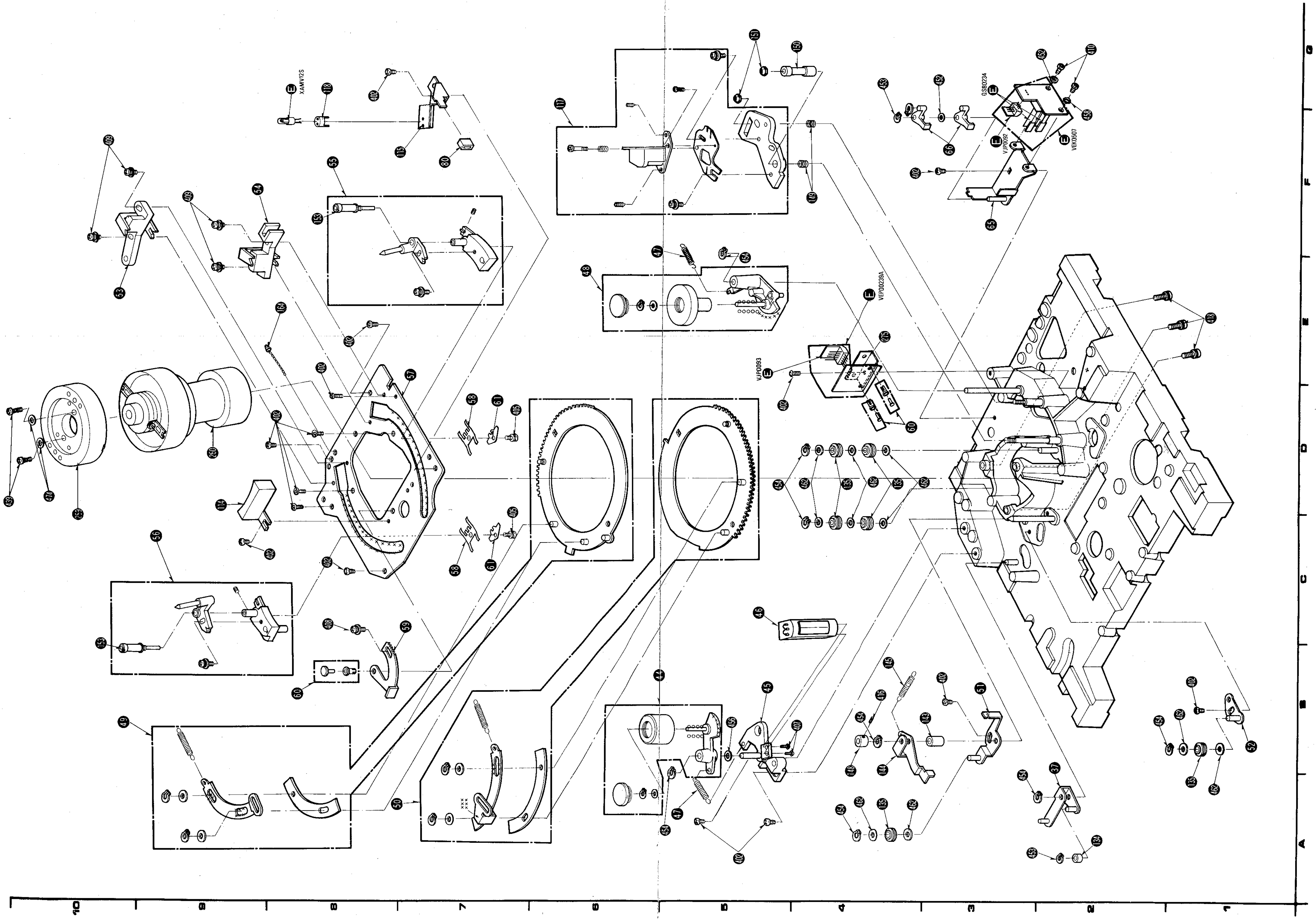
1. *Transport Section*
2. *Moving Mechanism Section*
3. *Chassis Parts Section-(1)*
4. *Button Unit Section*
5. *Chassis Parts Section-(2)*
6. *Chassis Frame Section-(1)*
7. *Chassis Frame Section-(2)*
8. *Tuner Parts Section*
9. *Casing Parts Section*
10. *Packing Parts Section*

LUBRICATION POINTS

When the marked parts are replaced, apply the recommended lubricants for better maintenance of the unit.

Marks	Kind of Lubricant	Availability	Part Number
×××	Morlytone Grease	Available From Factory	MOR265
○○○	Spindle Oil	Buy in the States	---------------

EXPLODED VIEW ❶ *Transport Section*


XAMV12S
QSB0234
VJP0092
VEK0507
VEP00239A
VJP0093
G
F
E
D
C
B
A
10
9
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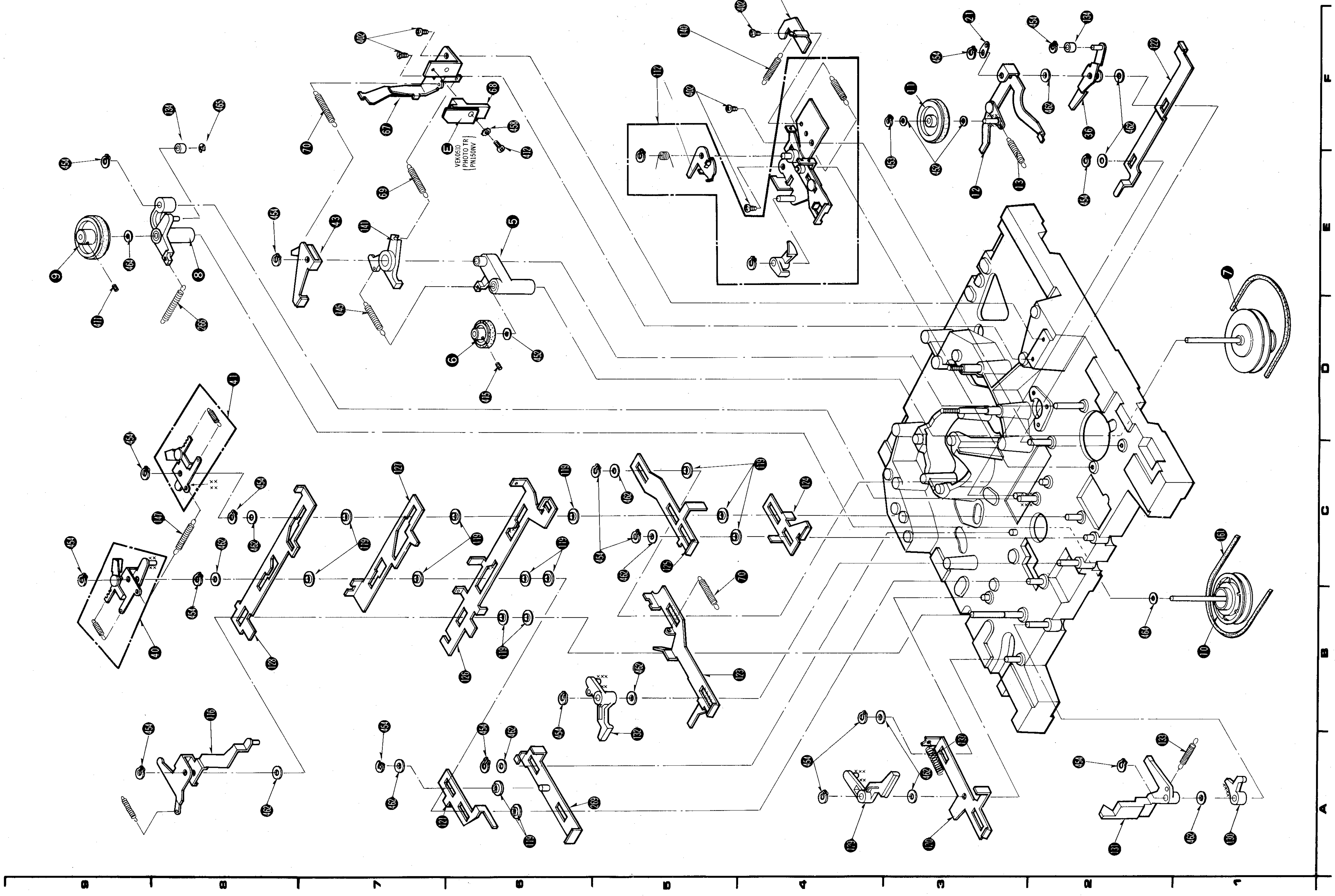
1

② *Moving Mechanism Section*


VEK0510
(PHOTO TR)
(PN150NV)
E
402
139
140
112
21
454
134
122
11
453
452
12
13
36
462
68
458
412
67
70
69
130
465
9
464
8
411
266
43
141
145
5
6
415
7
41
147
127
119
124
125
10
40
128
126
123
116
121
269
132
129
137
133
131
120
F
E
D
C
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A
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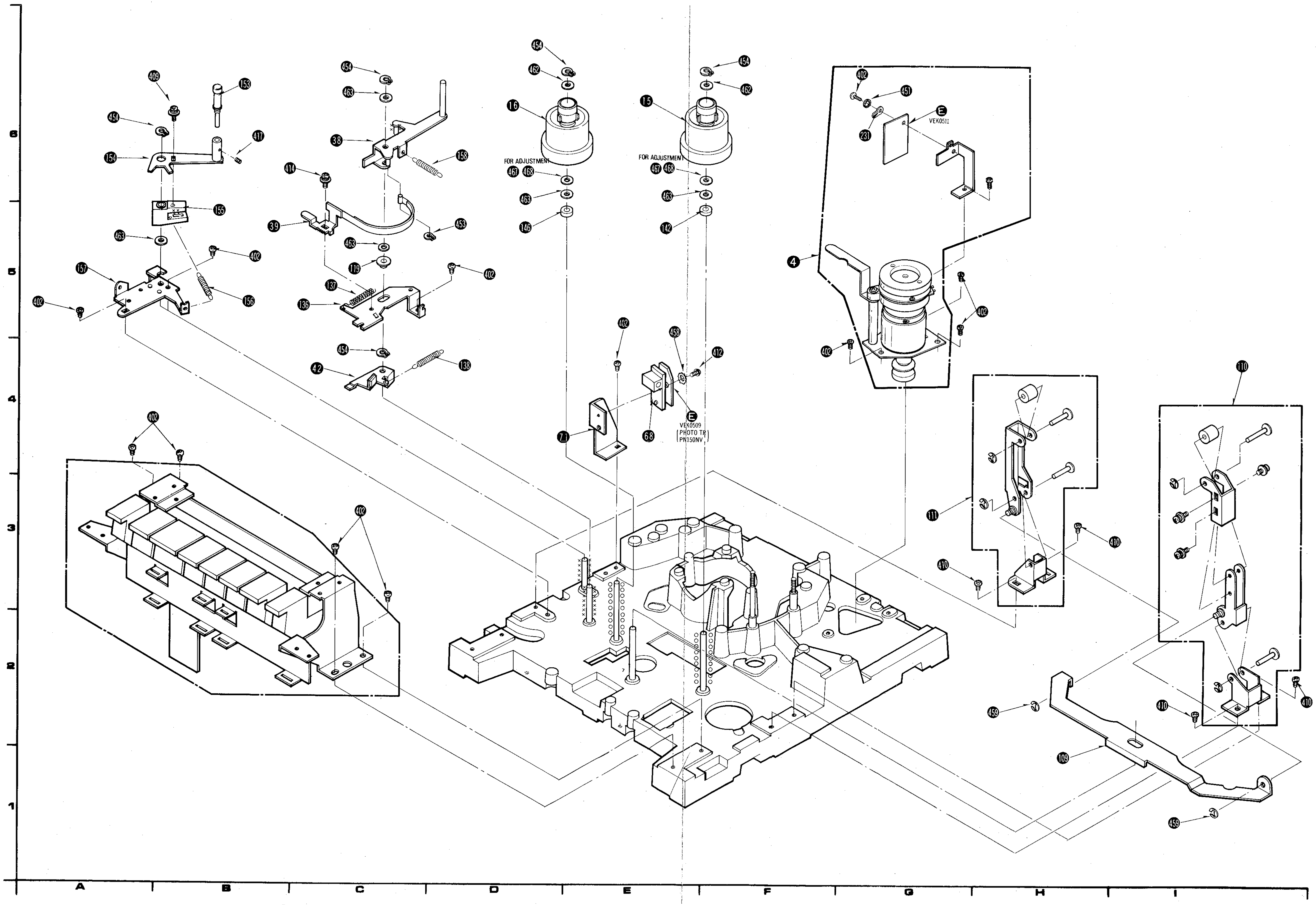
9

❸ *Chassis Parts Section-(1)*



409
153
454
417
154
155
463
402
157
156
402
454
463
38
158
414
39
453
463
119
137
136
402
454
138
42
454
462
16
FOR ADJUSTMENT
467
468
463
146
454
462
15
FOR ADJUSTMENT
467
468
463
142
402
451
E
VEK0511
231
4
402
402
402
402
458
412
71
68
E
VEK0509
(PHOTO TR PN150NV)
402
402
110
111
410
410
459
109
410
410
459
6
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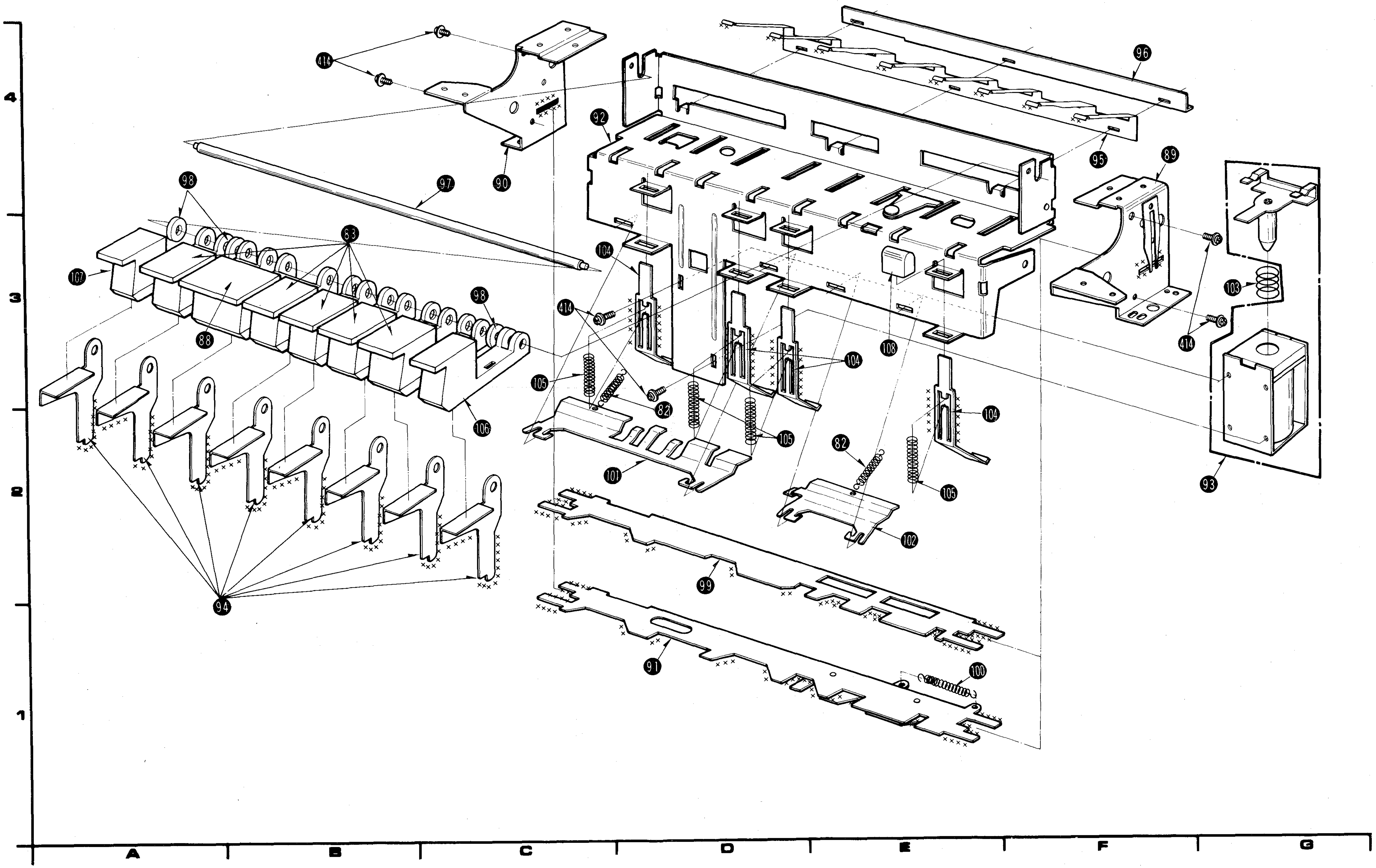
I

④ *Button Unit Section*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88
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414
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103
414
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104
106
101
105
82
104
105
102
99
91
100
94
4
3
2
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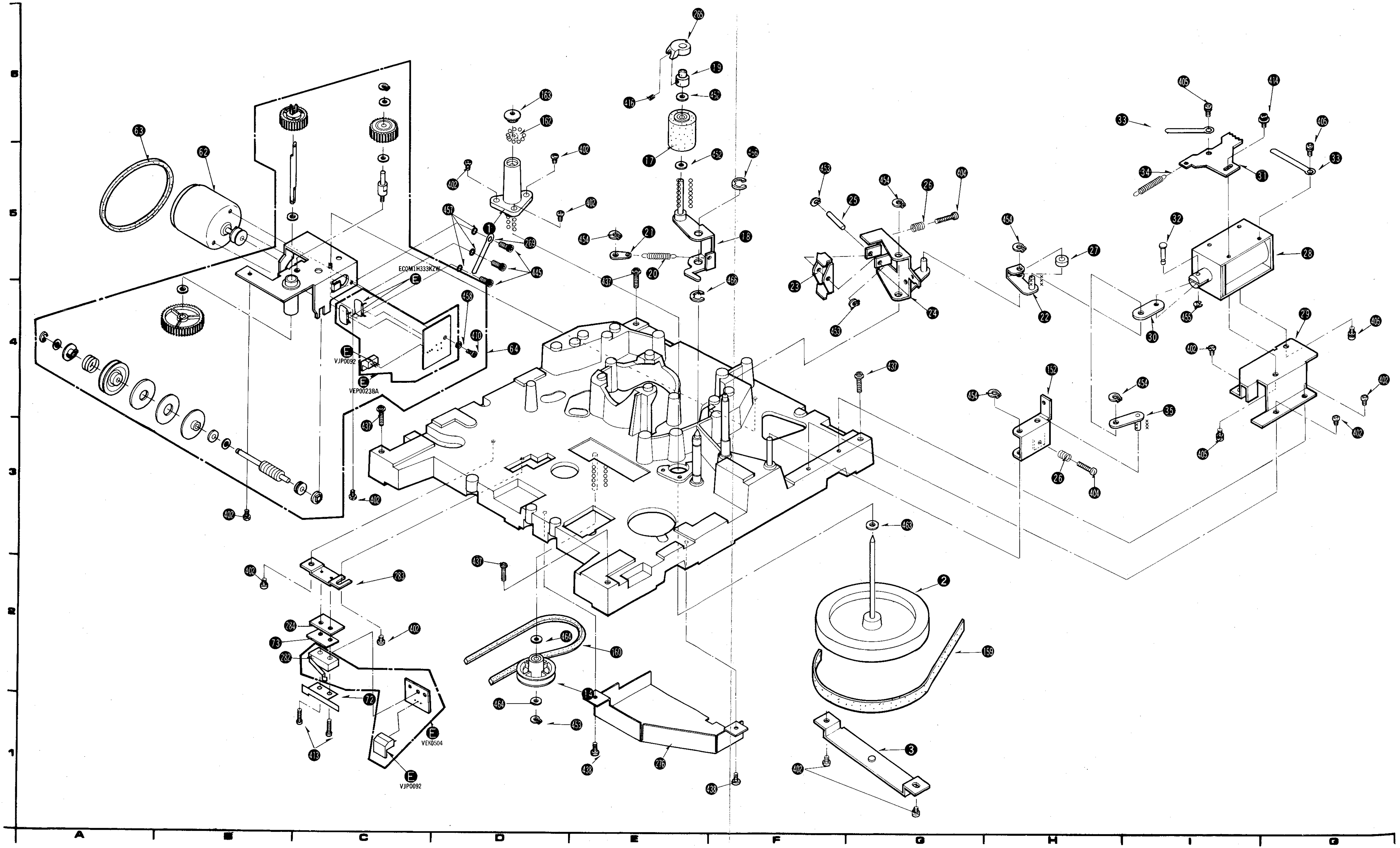
G

❺ *Chassis Parts Section-(2)*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416
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163
162
402
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452
456
63
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402
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18
453
25
454
26
404
23
24
453
466
445
ECQM1H333KZW
E
458
410
64
E
VJP0092
E
VEP0023BA
437
437
437
405
414
405
33
33
34
31
32
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454
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455
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405
402
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152
454
454
35
26
404
402
405
463
2
159
3
402
402
283
284
73
282
402
72
413
E
VEK0504
E
VJP0092
464
160
14
464
453
438
276
438
437
402
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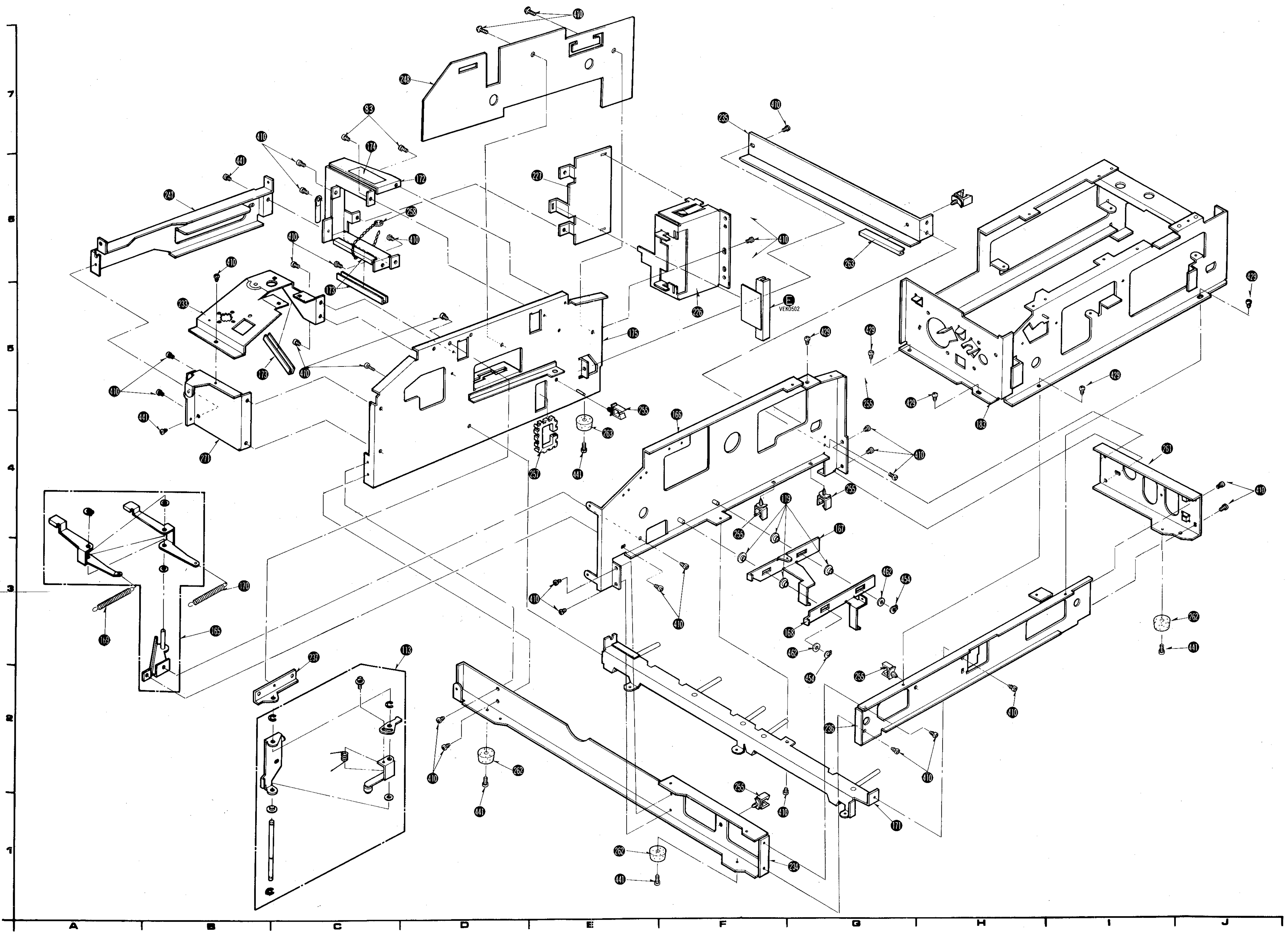
❻ *Chassis Frame Section-(1)*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248
83
410
174
172
441
247
258
410
410
227
410
235
410
233
173
173
175
226
E
VEK0502
263
429
429
429
429
410
271
441
255
263
166
255
183
410
257
441
261
410
119
255
255
167
170
410
410
462
454
169
165
168
262
441
462
454
237
113
255
410
236
410
410
262
441
255
410
171
262
441
234
7
6
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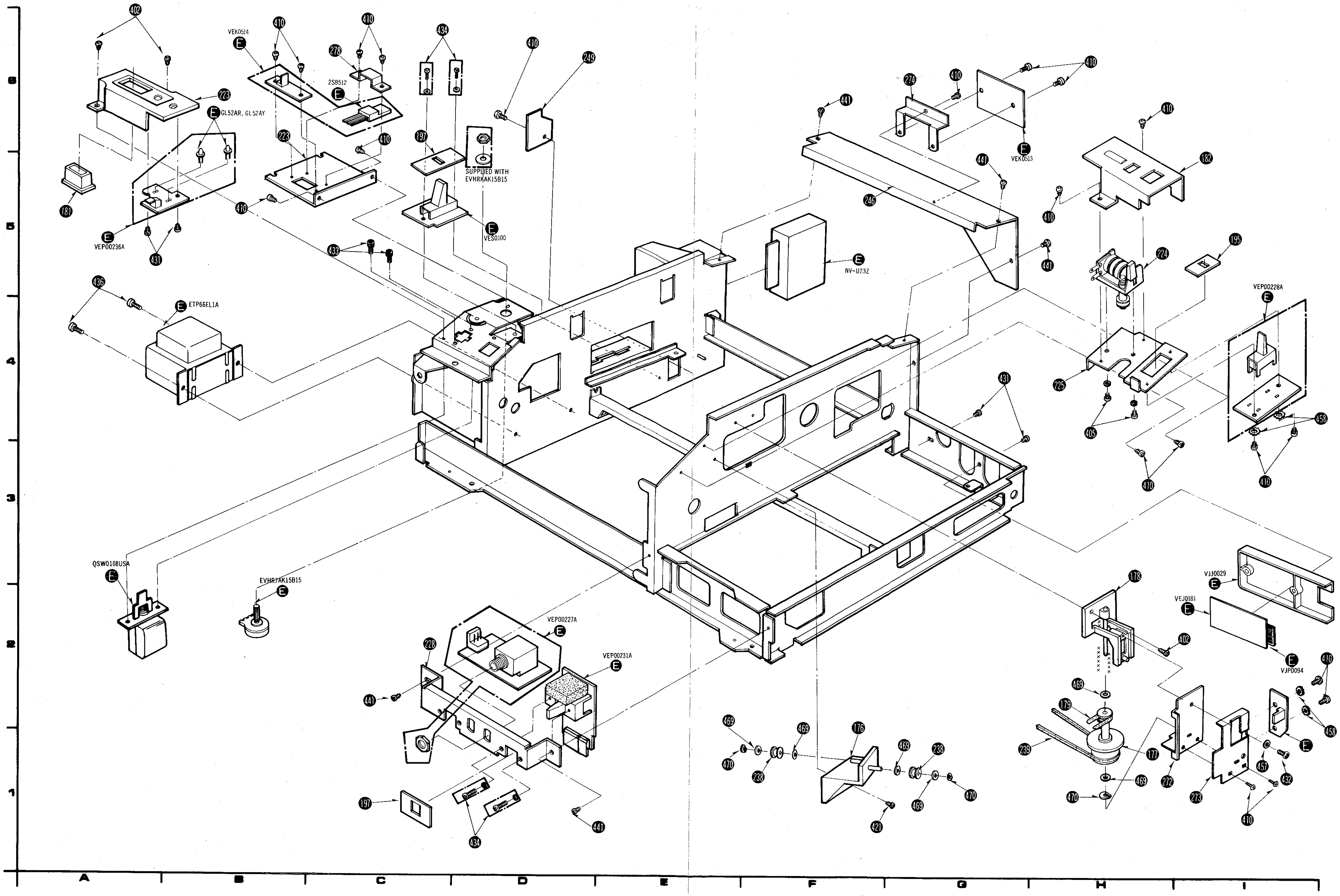
❼ *Chassis Frame Section-(2)*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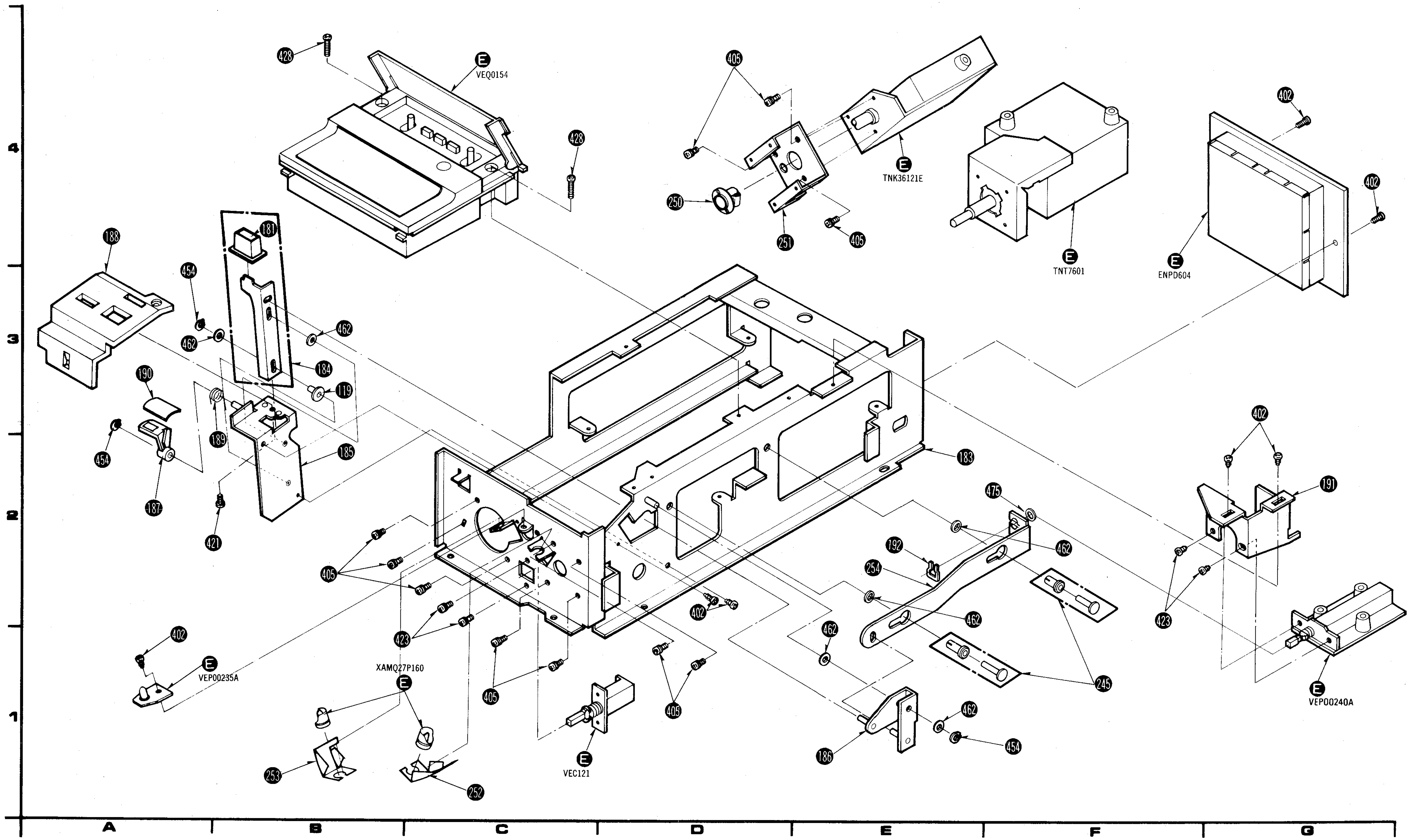
❽ *Tuner Parts Section*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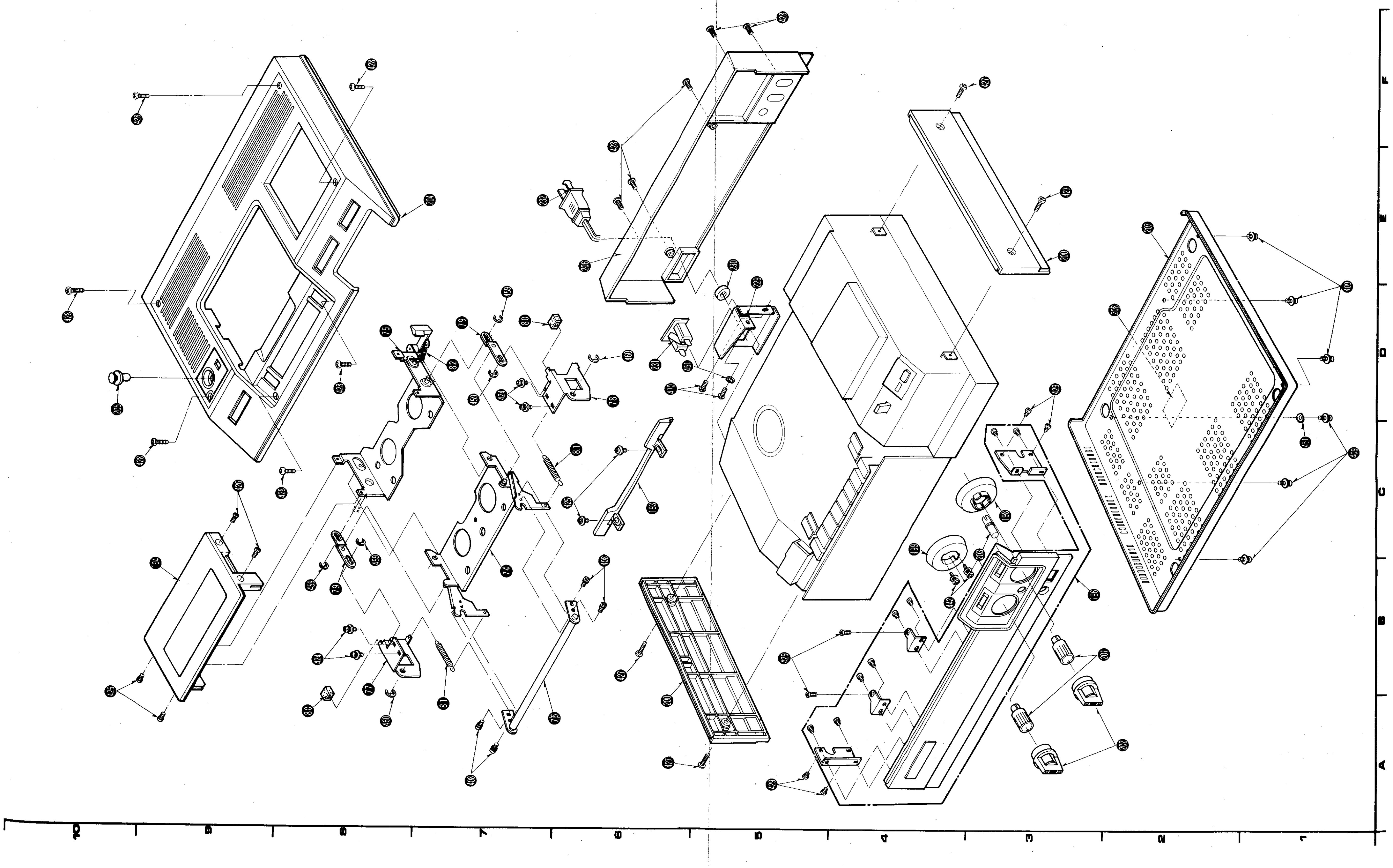
⑨ *Casing Parts Section*



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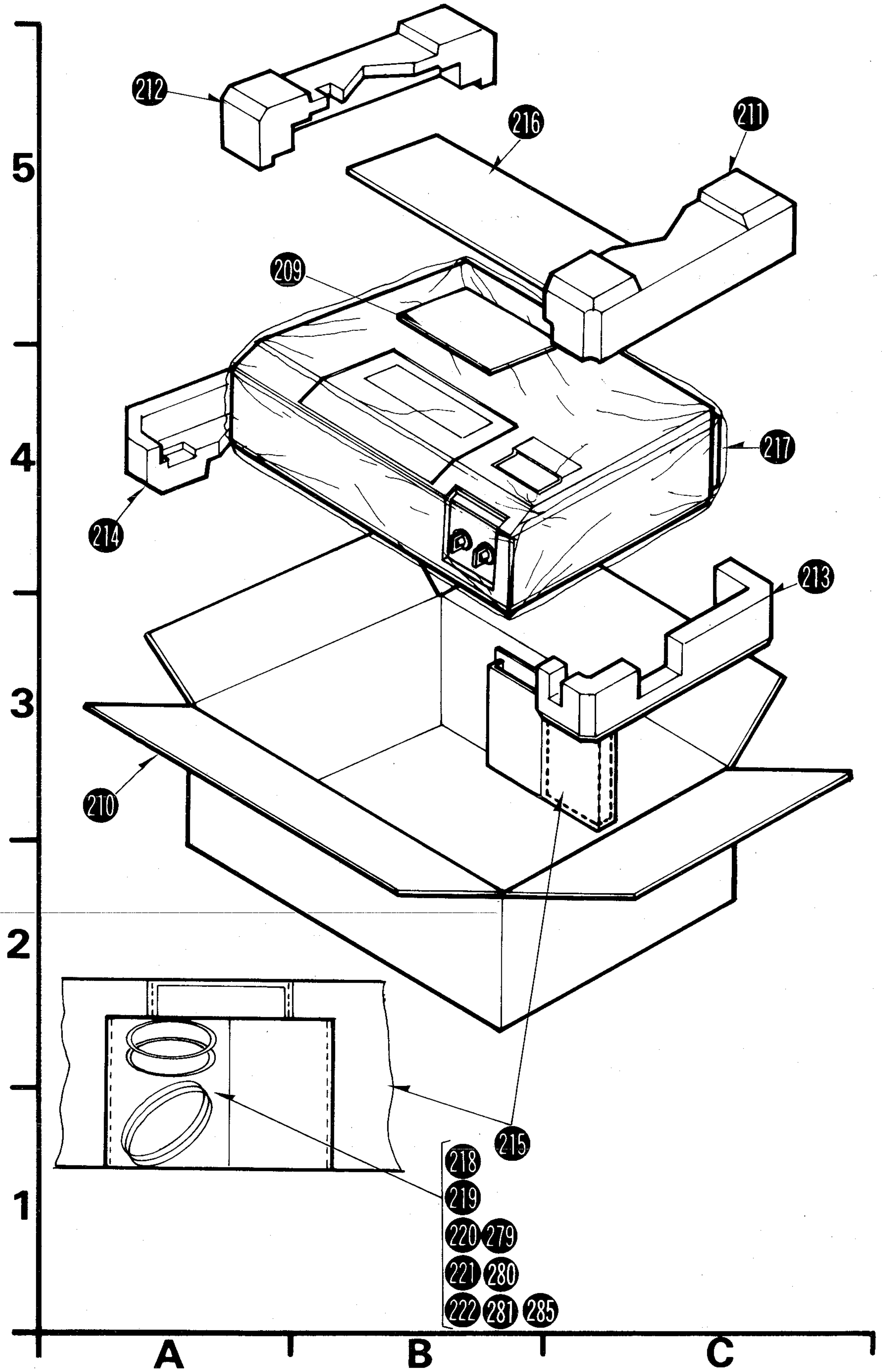
⑩ *Packing Parts Section*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MECHANICAL REPLACEMENT PARTS LIST

Model No. PV-1100

Note: * Be sure to make your orders of replacement parts according to this list.

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
		Chassis Unit	1		
1	5(5-D)	Capstan Holder Unit	1	VXD0032	
2	5(2-G)	Capstan Shaft Unit	1	VXP0169	
3	5(1-G)	Thrust Holder Unit	1	VXA0773	
4	3(5-G)	Capstan Motor Unit	1	VEM0081	
		Consist of			
		1. Motor Chassis Unit	1		
		2. Capstan Motor	1		
(47)	3	3. Roller Spring	1	VMB0470	
(E)	3(6-G)	4. Motor P.B. Unit	1	VEP00274	
(231)	3(6-G)	5. Lag	1	VJH12	
(451)	3(6-G)	6. Toothed Lock Washer	1	XWC3AF	
(402)	3(6-G)	7. Tapping Screw (3ø×8mm)	1	XTV3+8FFXS	
5	2(6-E)	Play Arm Unit	1	VXL0406	
6	2(6-D)	Play Idler Unit	1	VXP0213	
7	2(1-D)	Play Pulley A Unit	1	VXP0233	
8	2(8-E)	Rewind Arm Unit	1	VXL0405	
9	2(9-E)	Rewind Roller Unit	1	VXP0171	
10	2(1-B)	Main Pulley Unit	1	VXP0272	
		F.F. Idler Arm Unit	1		
		Consist of			
11	2(3-F)	1. F.F. Idler Unit	1	VXP0174	
12	2(3-F)	2. F.F. Arm B Unit	1	VXL0456	
13	2(3-E)	3. F.F. Arm Spring	1	VMB0401	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
(452)	2(3-F)	4. Washer (3ø)	2	XWXV3D	
(453)	2(3-F)	5. Retaining Ring (3ø)	1	XUEV3FP	
14	5(2-D)	Intermediate Pulley Unit	1	VXP0271	
15	3(6-F)	Takeup Reel Table	1	VXR0065	
16	3(6-D)	Supply Reel Table	1	VXR0064	
		Pressure Roller Arm Unit	1		
		Consist of			
17	5(5-E)	1. Pressure Roller Unit	1	VXG0006	
18	5(5-E)	2. Pressure Roller Arm Unit	1	VXL0458	
19	5(6-E)	3. Pressure Roller Cap Unit	1	VXD0044	
(452)	5(5-E,6-E)	4. Washer (3ø)	2	XWXV3D	
(403)	5	5. Hex. Screw (3ø×4mm)	1	XXE3D4FXKS	
20	5(5-E)	6. Return Spring A	1	VMB0403	
21	2(3-F),5(5-E)	7. Spring Hook	1	VMA2543	
		Pressure Lever Unit	1		
		Consist of			
22	5(4-H)	1. Connecting Lever A Unit	1	VXL0459	
23	5(4-F)	2. Pressure Link Unit	1	VXL0460	
24	5(4-G)	3. Pressure Lever 1 Unit	1	VXL0461	
25	5(5-F)	4. Pressure Pin	1	VMS1123	
26	5(3-H,5-G)	5. Adjust Spring	2	VMB0404	
27	5(5-H)	6. Spacer	1	VMX0147	
(453)	5(4-G,5-F)	7. Retaining Ring (3ø)	2	XUEV3FP	
(454)	5(4,5-G,H)	8. Retaining Ring (3ø)	4	XUEV4FP	
(404)	5(3-H)	9. Screw (3ø×12mm)	1	XSN3+12FXS	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
		Solenoid Unit	1		
		Consist of			
28	5(5-I)	1. Pressure Roller Solenoid	1	VSJ0036	
29	5(4-G)	2. Solenoid Bracket	1	VMA2972	
30	5(4-I)	3. Solenoid Lever	1	VML0534	
31	5(5-I)	4. Spring Hook Angle	1	VMA2996	
32	5(5-I)	5. Rivet Pin (3ø×13mm)	1	XRHV3XB	
(455)	5(4-I)	6. Retaining Ring (E-type)	1	XUC25FP	
(405)	5(4,6-I,4-G)	7. Screw with Washer (3ø×6mm)	3	XYB3+C6FXS	
33	5(6-I)	8. Clamper	2	TUX926	
34	5(5-I)	9. Pressure Lever Spring	1	VMB0405	
(414)	5(6-G)	10. Screw with Washer (3ø×6mm)	1	XYN3+F6FXS	
(406)	5	11. Screw with Washer (3ø×4mm)	1	XYN3+C4FXS	
35	5(4-I)	Connecting Lever B Unit	1	VXL0463	
36	2(2-F)	Action Lever	1	VXL0464	
37	1(2-A)	Cam Lever A Unit	1	VXL0466	
38	3(6-C)	Tension Arm Unit	1	VXL0467	
39	3(5-C)	Tension Band Unit	1	VXZ0047	
40	2(9-B)	Brake A Unit	1	VXZ0048	
41	2(8-C)	Brake B Unit	1	VXZ0049	
42	3(4-C)	Sub-Tension Arm A Unit	1	VXZ0050	
43	2(7-E)	Sub-Tension Arm B Unit	1	VXZ0051	
		Erase Head Base Unit	1		
		Consist of			
44	1(5-A)	1. Inertia Roller Arm Unit	1	VXP0197	
45	1(5-B)	2. Erase Head Base 1 Unit	1	VXK0254	
46	1(4-C)	3. Full Erase Head	1	VBS0014	
47	1(5-A,E)	4. Roller Spring	1	VMB0541	
(407)	1(5-B)	5. Screw with Washer (2ø×6mm)	2	XYN2+C6FX	
(454)	1(5-4)	6. Retaining Ring (4ø)	1	XUEV4FP	
(456)	1(5-B)	7. Washer (4ø)	1	XWXV4F9	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
48	1(5-E)	Inertia Roller Arm Unit	1	VXP0215	
49	1(9-A)	Loading Ring A Unit	1	VXA0702	
50	1(7-A)	Loading Ring B Unit	1	VXA0704	
51	1(3-B)	Roller Bracket A Unit	1	VXA0705	
52	1(1-B)	Roller Bracket B Unit	1	VXA0706	
		Loading Base Unit	1		
		Consist of			
53	1(10-F)	1. Lock Base A Unit	1	VXK0258	
54	1(9-E)	2. Lock Base B Unit	1	VXK0271	
55	1(8-E)	3. Loading Post (R) Unit	1	VXA0794	
56	1(9-C)	4. Loading Post (L) Unit	1	VXA0795	
57	1(8-D)	5. Loading Base	1	VMA2973	
58	1(7-C,D)	6. Shaft Holder Spring	2	VMA2560	
59	1(8-B)	7. Tension Spring Hook	1	VMA2551	
60	1(8-B)	8. Rivet	1	VHN0011	
61	1(7-C,D)	9. Protector	2	VMA3106	
(408)	1(8-C)	10. Screw with Washer (3ø×8mm)	1	XYN3+F8FXS	
(405)	1(7-C,D)	11. Screw with Washer (3ø×6mm)	2	XYN3+C6FXS	
(409)	1(9-E,F,10-F)	12. Screw with Washer (3ø×10mm)	4	XYN3+F10FXS	
		Loading Motor Unit	1		
		Consist of			
62	5(5-B)	1. Loading Motor Pulley Unit	1	VEM0074	
63	5(5-A)	2. Loading Belt	1	VDV0074	
64	5(4-C)	3. Loading Gear Unit	1	VXP0225	
(E)	5(4-C)	4. Loading Motor P.C.Board	1	VEP00238A	
(E)	5(4-C)	5. 3 Pin Connector	1	VJP0092	
(E)	5(4-C)	6. Semicon Capacitor	2	ECEM1H333KZW	
(269)	5(5-D)	7. Clamper	1	VJR3	
(410)	5(4-D)	8. Tapping Screw (3ø×6mm)	1	XTV3+6FFXS	
(445)	5(5-D)	9. Bolt with Hex. Head (3ø)	3	XVE3AFXS	
(457)	5(5-D)	10. Spring Washer (3ø)	3	XWA3	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
(451)	5	11. Toothed Lock Washer (3ø)	1	XWC3AF	
		Leaf Switch Bracket Unit	1		
		Consist of			
65	1(3-F)	1. Switch Bracket Unit	1	VXA0775	
66	1(3-F)	2. Switch Link	2	VML0571	
(452)	1(2-G,3-F)	3. Washer (3ø)	2	XWXV3D	
(410)	1(2-G)	4. Tapping Screw (3ø×6mm)	2	XTV3+6FFXS	
(453)	1(4-F)	5. Retaining Ring (3ø)	1	XUEV3FP	
(E)	1(3-F)	6. Leaf Switch	2	QSB0234	
(E)	1(3-F)	7. Leaf Switch P.C. Board	1	VEK0507	
(E)	1(3-F)	8. 3 Pin Connector	1	VJP0092	
(458)	1(2-G)	9. Toothed Lock Washer (3ø)	1	XWC3BF	
		Cassette Opener Unit	1		
		Consist of			
67	2(7-F)	1. Cassette Opener Unit	1	VXA0863	
68	2(6-F),3(4-E)	2. Transistor Holder	1	VMA2568	
(412)	2(6-F)	3. Screw With Washer (3ø×8mm)	1	XSN3+8FXS	
69	2(7-E)	4. Play Arm Spring B	1	VMB0400	
70	2(5-B,7-F)	5. Play Arm Spring	2	VMB0410	
(E)	2(6-F)	6. Takeup Sensor P.C.Board	1	VEK0510	
(E)	2(6-F)	7. Photo Transistor	1	PN150NV	
(458)	2(6-F)	8. Toothed Lock Washer (3ø)	1	XWC3BF	
		Transistor Bracket Unit	1		
		Consist of			
71	3(4-E)	1. Transistor Bracket	1	VMA2569	
(68)	3(4-E)	2. Transistor Holder	1	VMA2568	
(412)	3(4-E)	3. Screw with Washer (3ø×8mm)	1	XSN3+8FXS	
(E)	3(4-E)	4. Supply Photo TR Connection P.C. Board	1	VEK0509	
(E)	3(4-E)	5. Photo Transistor	1	PN150NV	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
(458)	3(4-E)	6. Toothed Lock Washer (3ø)	1	XWC3BF	
		Micro Switch Unit	1		
		Consist of			
(282)	5(2-C)	1. Micro Switch	1	VSM0027	
(283)	5(2-C)	2. Micro Switch Bracket	1	VMA2598	
(284)	5(2-C)	3. Micro Switch Fiber	1	VMA5377	
72	5(1-C)	4. Actuator	1	VML0563	
73	5(2-C)	5. Switch Spacer	1	TMK98908	
(413)	5(1-C)	6. Screw with Washer (2ø• 10mm)	2	XYN2+C10FX	
(E)	5(2-C)	7. Tape Slack Switch P.C. Board	1	VEK0504	
(E)	5(1-C)	8. 3 Pin Connector	1	VJP0092	
		Cassette Up Holder Unit	1		
		Consist of			
74	9(7-B)	1. Cassette Up Unit	1	VXA0836	
75	9(8-C)	2. Cassette Holder Unit	1	VXA0837	
76	9(7-A)	3. Cassette Up Shaft Unit	1	VSA0724	
77	9(8-B)	4. Left Stand Unit	1	VXA0725	
78	9(6-D)	5. Right Stand Unit	1	VXA0726	
79	9(7-D,8-C)	6. Cassette Up Arm	2	VML0703	
80	9(7-D,8-A)	7. Stand Cushion	2	VMG0170	
81	9(7-B,C)	8. Cassette Up Spring	2	VMB0422	
(408)	9(6-B,7-A)	9. Screw with Washer (3ø×8mm)	4	XYN3+F8FXS	
(459)	9(7-D,8-B)	10. Retaining Ring (E-type)	4	XUC3FP	
(460)	9(6-D,8-A)	11. Retaining Ring (E-type)	2	XUC4FP	
82	9(7-D)	12. Lock Spring	1	VMB0423	
		Main Button Unit	1		
		Consist of			
83	4(3-A,B)	1. Play Button Unit	(1)	VXU0089	
(83)	4(3-A)	2. Rewind Button Unit	(1)	VXU0089	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
(83)	4(3-B)	3. F.F. Button Unit	(1)	VXU0089	
(83)	4(3-B)	4. Record Button Unit	(1)	VXU0089	
(83)	4(3-B)	5. Audio Dub. Button Unit	(1)	VXU0089	
88	4(3-B)	6. Stop Button Unit	1	VXU0090	
89	4(3-F)	7. Button Frame Holder B Unit	1	VXA0784	
90	4(4-C)	8. Button Frame Holder A Unit	1	VXA0785	
91	4(1-D)	9. Button Slide Lever Unit	1	VXL0474	
92	4(3-D)	10. Button Frame Unit	1	VXA0730	
93	4(3-G)	11. Stop Solenoid	1	VSJ0033	
94	4(2-A,B,C)	12. Button Lever	8	VML0574	
95	4(4-E)	13. Button Spring Plate	1	VMA2579	
96	4(4-E)	14. Spring Lock Plate	1	VMA2580	
97	4(4-B)	15. Button Shaft	1	VMS1150	
98	4(3-A,B,C)	16. Button Spacer	3	VMX0135	
99	4(2-D)	17. Button Slide Lever A	1	VML0580	
100	4(1-E)	18. Button Lever Spring	1	VMB0426	
101	4(2-D)	19. Lock Plate A	1	VML0576	
102	4(2-E)	20. Lock Plate B	1	VML0577	
(82)	4(2-E,3-C)	21. Lock Spring	2	VMB0423	
103	4(3-G)	22. Solenoid Spring	1	VMB0424	
104	4(3-D)	23. Leaf Lever	4	VML0579	
105	4(2-D,E,3-C)	24. Leaf Lever Spring	3	TMB0425	
(414)	4(3-C,D,G, 4-B,C)	25. Screw with Washer (3ø×6mm)	6	XYN3+F6FXS	
106	4(3-C)	26. Pause Button Unit	1	VGU0108	
(106)	4(3-A)	27. Eject Button Unit	(1)	VGU0108	
107	4(2-E)	28. Pause Lever Spring	1	VMB0558	
108	4(3-E)	29. Leaf Lever Cap	1	VMX0152	
		Cassette Lock Arm Unit	1		
		Consist of			
109	3(2-I)	1. Connect Lever	1	VMA2967	
110	3(3-I)	2. Cassette Arm A Unit	1	VXL0529	
111	3(3-H)	3. Cassette Arm B Unit	1	VXL0530	
(459)	3(1-I,2-H)	4. Retaining Ring (E-Type)	2	XUC3FP	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
112	2(4-E)	Pause Slide Lever Unit	1	VXL0526	
113	6(2-C)	Eject Link	1	VXL0482	
114	1(9-D)	Dew Detector Unit	1	VEK0294	
116	2(8-A)	Band Release Lever	1	VXL0488	
		A/C Head Unit	1		
		Consist of			
115	1(7-F)	1. Lamp Bracket Unit	1	VXA0787	
117	1(5-F)	2. A/C Head Base Unit	1	VEH0074	
(275)	1(4-E)	3. A/C Head P.B. Bracket	1	VMA2681	
(80)	1(7-F)	4. Stand Cushion	1	VMG0170	
(60)	1(8-B)	5. Rivet	2	VHN0011	
(E)	1	6. A/C Head P.C. Board	1	VJB00245	
(E)	1(4-E)	7. Inter Connection P.C. Board	1	VEK0512	
(E)	1(4-E)	8. Connector	1	VJP0093	
118	1(8-F)	9. Lamp Spacer	1	VMX0148	
(E)	1(8-F)	10. Sensor Lamp	1	XAMV12S	
		Mechanical Chassis Unit	1		
		Consist of			
119	2,3,6,8	1. Slide Washer A	20	VMX0122	
120	2(3-A)	2. Eject Lever	1	VML0606	
(270)	2(5-A)	3. Charge Slide Lever A	1	VXA0953	
121	2(6-A)	4. Charge Slide Lever	1	VML0543	
122	2(2-F)	5. Soft Brake Lever	1	VML0545	
123	2(5-B)	6. Play Slide Lever	1	VML0546	
124	2(4-C)	7. Rec. Slide Lever B	1	VML0548	
125	2(5-C)	8. Rec. Slide Lever A	1	VML0547	
(70)	2(5-B,7-E)	9. Play Lever Spring	2	VMB0410	
126	2(6-C)	10. Rewind Slide Lever	1	VML0549	
127	2(7-C)	11. Check Slide Lever	1	VML0550	
128	2(8-C)	12. F.F. Slide Lever	1	VML0551	
129	2(4-A)	13. Rewind Lever	1	VML0552	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
130	2(1-A)	14. Connecting Link Assy	1	VML0554	
131	2(2-A)	15. Safety Link	1	VML0555	
132	2(5-B)	16. F.F. Lever	1	VML0553	
133	2(1-A)	17. Rewind Arm Spring	1	VMB0398	
(8)	2(8-E)	18. Rewind Arm Unit	1	VXL0405	
134	1(2-A,8-E), 2(2-F)	19. Sub. Roller A	3	VDP0543	
(10)	2(1-B)	20. Main Pulley Unit	1	VXP0272	
(9)	2(9-E)	21. Rewind Roller Unit	1	VXP0171	
(36)	2(2-F)	22. Action Lever Unit	1	VXL0464	
135	1(1-B,4-A,C,D)	23. Loading Roller	6	VDP0546	
(43)	2(7-E)	24. Sub-Tension Arm A Unit	1	VXZ0050	
136	3(5-C)	25. Tension Arm Base	1	VMA2550	
137	2(3-A)	26. Eject Lever Spring	1	VMB0409	
(1)	5(5-D)	27. Capstan Holder	1	VXD0032	
(5)	2(6-E)	28. Play Arm Unit	1	VXL0406	
(43)	2(7-E)	29. Sub-Tension Arm B Unit	1	VXZ0051	
138	3(4-C)	30. Sub-Tension Spring B	1	VMB0420	
(112)	2(4-E)	31. Pause Slide Lever Unit	1	VXL0526	
139	2(4-F)	32. Idler Stopper	1	VMA2596	
140	2(4-F)	33. Return Spring B	1	VMB0430	
141	2(7-I)	34. Sub-Play Arm	1	VML0530	
142	3(5-F)	35. Spacer	1	VMX0146	
(52)	1(1-B)	36. Roller Bracket B Unit	1	VXA0706	
(50)	1(7-A)	37. Loading Ring B Unit	1	VXA0704	
(51)	1(3-B)	38. Roller Bracket A Unit	1	VXA0705	
(49)	1(9-A)	39. Loading Ring A Unit	1	VXA0702	
(37)	1(2-A)	40. Cam Lever A Unit	1	VXL0466	
143	1(3-B)	41. Spacer	1	VMX0139	
144	1(4-B)	42. Charge Link	1	VML0566	
145	1(4-B,7-D)	43. Play Arm Spring A	2	VMB0399	
146	3(5-D)	44. Thrust Bearing	1	VDB0364	
(16)	3(6-D)	45. Supply Reel Table	1	VXR0064	
(15)	3(6-F)	46. Takeup Reel Table	1	VXR0065	
(40)	2(9-B)	47. Brake A Unit	1	VXZ0048	
(41)	2(8-C)	48. Brake B Unit	1	VXZ0049	
147	2(8-C)	49. Brake Arm Spring	1	VMB0414	
148	1(4-B)	50. Cassette Support	1	VMX0121	
149	1(4-F)	51. Post Spring C	2	VMB0417	
150	1(4-G)	52. Post Sleeve B	1	VMX0129	
151	1(5-G)	53. Adjusting Nut A	2	VHN0008	
(4)	3(5-G)	54. Capstan Motor Unit	1	VEM0081	
(28)	5(5-I)	55. Pressure Roller Solenoid	1	VSJ0036	
152	5(4-H)	56. Spring Hook Lever	1	VML0537	
(26)	5(3-H)	57. Adjusting Spring	2	VMB0404	
(35)	5(4-I,5-G)	58. Connecting Lever B Unit	1	VXL0463	
(48)	1(5-E)	59. Inertia Roller Arm Unit	1	VXP0215	
(116)	2(8-A)	60. Band Release Lever Unit	1	VXL0488	
153	1(8-F,9-B), 3(6-B)	61. Roller Post Unit	3	VXA0743	
154	3(6-B)	62. Threading Arm Unit	1	VXL0465	
155	3(5-B)	63. Cam Lever B	1	VML0605	
156	3(5-B)	64. Cam Lever Spring	1	VMB0408	
157	3(5-A)	65. Cassette Stud Base	1	VMA2684	
(38)	3(6-C)	66. Tension Arm Unit	1	VXL0467	
(39)	3(5-C)	67. Tension Band Unit	1	VXZ0047	
158	3(5-C)	68. Tension Arm Spring	1	VMB0406	
(14)	5(2-D)	69. Intermediate Pulley Unit	1	VXP0271	
(2)	5(2-G)	70. Capstan Shaft Unit	1	VXP0169	
159	5(2-G)	71. Capstan Belt	1	VDV0094A	
(159)	5(2-G)	71. Capstan Belt	(1)	VDV0094B	
(159)	5(2-G)	71. Capstan Belt	(1)	VDV0094C	
160	5(2-D)	72. Reel Belt A	1	VDV0072	
161	2(1-B)	73. Reel Belt B	1	VDV0092	
(3)	5(1-G)	74. Thrust Holder Unit	1	VXA0773	
162	5(6-D)	75. Oil Pool	1	VMT0022	
163	5(6-D)	76. Oil Cap	1	VMX0123	
(114)	1(9-D)	77. Dew Detector Unit	1	VEK0294	
164	1(8-E)	78. Fastener	1	WZBV1	
(7)	1(1-D)	79. Play Pulley A Unit	1	VXP0233	
(6)	2(6-D)	80. Play Idler Unit	1	VXP0213	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
		Center Frame B Unit	1		
		Consist of			
165	6(3-B)	1. Switch Link Unit	1	VXL0473	
166	6(4-F)	2. Center Frame A Unit	1	VXL0930	
167	6(3-F)	3. Audio Slide Lever	1	VMA0814	
168	6(3-G)	4. Servo Slide Lever	1	VMA0815	
(119)	6(3-F,G)	5. Slide Washer A	4	VMX0122	
(469)	6(3-G)	6. Washer (4ø)	2	XWXV4D9	
(454)	6(3-G)	7. Retaining Ring	2	XUEV4FP	
(410)		8. Tapping Screw (3ø×6mm)	2	XTV3+6FFXS	
169	6(3-A)	9. Switch Lever Spring	1	VMB0421	
170	6(3-B)	10. Servo Slide Lever Spring	1	VMB0540	
(255)	6	11. Lead Clamper (Large)	6	VJF0004	
171	6(2-F)	Center Angle A Unit	1	VXA0932	
175	6(5-D)	Left Slide Frame Unit	1	VXA0927	
		Left Corner Angle	1		
		Consist of			
172	6(6-C)	Left Corner Angle B	1	VMA2697	
173	6(5-C)	Fringe	2	VME0026	
174	6(6-C)	Fuse Replacement Label	1	VQL0772	
		Connecting Pulley Holder Unit	1		
		Consist of			
(272)	7(2-I)	1. Connecting Pulley Angle	1	VMA3512	
(273)	7(2-I)	2. Reel Sensor P.B. Angle	1	VMA3513	
(458)	7(2-I)	3. Toothed Lock Washer (3ø)	2	XWC3BF	
177	7(2-H)	4. Connecting Pulley Unit	1	VXA0887	
178	7(2-H)	5. Pulley Holder C Unit	1	VXA0987	
179	7(2-H)	6. Counter Belt B	1	VDV0076	
(469)	7(1-H,2-H)	7. Washer (2ø)	2	XWXV2D	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
(470)	7(1-H)	8. Retaining Ring (2ø)	1	XUEV2FP	
(432)	7(1-I)	9. Tapping Screw (3ø×10mm)	1	XTV3+10BFX	
(E)	7(2-I)	10. Reel Sensor P.C. Board	1	VEK0503	
180	7	11. Shield Washer	1	TMK76304	
(457)	7(2-I)	12. Spring Washer (3ø)	1	XWA3	
(410)	7(1-I)	13. Tapping Screw (3ø×6mm)	2	XTV3+6FFXS	
181	7(5-A),8(4-B)	Switch Button Unit	2	VXU0081	
182	7(6-H)	Counter Cover Unit	1	VYF0069	
183	6(5-H),8	Tuner Angle Unit	1	VXA0777	
186	8(1-E)	Antenna Switch Lever C Unit	1	VXL0489	
		Antenna Switch Holder Unit	1		
		Consist of			
184	8(3-B)	1. Antenna Switch Lever Unit	1	VXL0490	
185	8(2-B)	2. Antenna Switch Base Unit	1	VXL0746	
187	8(2-A)	3. Antenna Switch Indicator	1	VML0599	
188	8(3-A)	4. Antenna Switch Holder A	1	VYF0101	
189	8(3-B)	5. Antenna Indicator Spring	1	VMB0431	
190	8(3-A)	6. Antenna Indicator Decoration	1	VGK0598	
(462)	8(3-B)	7. Washer (4ø)	2	XWXV4D9	
(454)	8(3-A)	8. Retaining Ring (4ø)	3	XUEV4FP	
(421)	8(2-B)	9. Tapping Screw (3ø×8mm)	1	XTV3+8BFXS	
		Antenna Switching Unit	1		
		Consist of			
(E)	8(2-G)	1. Antenna Selector P.C.Board	1	VEP00240A	
191	8(2-G)	2. Antenna Switch Holder B	1	VMA2639	
(423)	8(2-F)	3. Screw with Washer (2.6ø×6mm)	2	XYN26+C6FX	
192	8(2-E)	4. Antenna Switch Washer	1	VMA2640	
(475)	8(2-F)	5. Washer	1	XWG6	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
193	9(6-C)	Cassette Guide	1	VGQ0039	
194	9(9-B)	Cassette Cover Unit	1	VYP0342	
195	7(5-I)	Switch Cover B	1	VGK0442	
196	9(3-B)	Front Panel Unit	1	VYP0347	
197	7(1-C,6-C)	Switch Cover A	2	VGK0553	
198	9(4-C)	VHF Indicator	1	VGK0568	
199	9(4-C)	UHF Indicator	1	VGK0522	
200	9(3-E,5-B)	Side Panel Unit	2	VYP0343	
201	9(3-A,B)	VHF Tuning Knob	2	VGT0108	
202	9(3-A)	VHF Knob Assembly	2	VGT0118	
203	9(3-C)	AFC Button	1	VGU0109	
204	9(9-D)	Top Panel Unit	1	VYP0348	
205	9(10-D)	Tracking Knob	1	VGT43K	
206	9(5-E)	Rear Panel Unit	1	VYP0346	
		Bottom Plate Unit	1		
		Consist of			
207	9(2-D)	1. Bottom Plate	1	VKU0086	
208	9(2-D)	2. Caution Label	1	VQL0704	
209	10(5-B)	Fan Bag Kit	1	VQF0393	
210	10(3-B)	Packing Case	1	VPG0549	
211	10(5-C)	Right Cushion (Top)	1	VPN0424	
212	10(5-B)	Left Cushion (Top)	1	VPN0425	
213	10(3-C)	Right Cushion (Bottom)	1	VPN0426	
214	10(4-A)	Left Cushion (Bottom)	1	VNP0427	
215	10(2-A)	Accessory Case	1	VNP0409	
216	10(5-B)	Cassette Pad	1	VPN0410	
217	10(4-B,C)	Polyethylene Bag	1	VPN0112	
218	10(2-A)	VHF Matching Box	1	VSQ0015	
219	10(2-A)	Coaxial Connector Cable	1	VJA0103	
220	10(2-A)	Twin Lead Connector Cable	2	VJA0102	
221	10(2-A)	VHF Antenna Adaptor	1	VSQ0057	
222	10(2-A)	Remote Pause Switch	1	NV-A182	
223	7(6-A)	Power Button Panel	1	VGU0028	
224	7(5-H)	Counter	1	VDC0014	
225	7(4-H)	Counter Chassis	1	VMA3255	
226	6(6-F)	RF Converter Guide A	1	VMA3261	
227	6(6-E)	RF Converter Guide B	1	VMA3405	
228	7(2-D)	Switch Angle	1	VMA2620	
229	9(5-D)	AC Panel	1	VMA3490	
230	9(5-D)	Cord Bushing	1	VJF0017	
231	9(6-D)	AC Outlet	1	VJSS0001	
232	9(6-E)	Power Cord	1	VJA0108	
233	6(5-B)	Power Switch Angle	1	VMA2990	
234	6(2-E)	Front Angle	1	VMA2606	
235	6(5-G)	Rear Frame	1	VMA2662	
236	6(3-H)	Right Side Angle	1	VMA3408	
237	6(2-C)	Shaft Guide Angle	1	VMA2685	
238	7(1-F,G)	Guide Pulley	2	VDP0554	
239	7(2-H)	Counter Belt A	1	VDV0075	
240		Servo P.B. Angle A	1	VMA3312	
241		Servo P.B. Angle B	1	VMA3264	
242		Support Angle C	2	VMA2630	
243		Video P.B. Angle A	1	VMA3427	
244		Video P.B. Angle B	1	VMA2691	
245	8(1-E,2-F)	Rivet	2	VDB0358	
246	7(5-F)	Rear Angle (Top)	1	VMA3409	
247	6(6-B)	Left Handle	1	VMA2689	
248	6(7-D)	Protector K	1	VMZ0247	
249	7(6-D)	Protector C	1	VMZ0209	
250	8(4-D)	Indicator Stopper	1	VGQ0012	
251	8(4-D)	UHF Tuner Angle	1	VMA2667	
252	8(1-C)	Reflection Plate B	1	VMA3002	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
253	8(1-B)	Reflection Plate A	1	VMA3001	
254	8(2-E)	Antenna Switch Lever B	1	VML0603	
255	6	Lead Clamper (Large)	6	VJF0004	
256		Lead Clamper (Small)	1	VJF0013	
257	6(4-D)	Bushing	1	VME0030	
258	6(6-C)	Clamper	1	TMM5402	
259	1(10-D)	Upper Cylinder Unit	1	VEH0070	
260	1(9-D)	D.D. Cylinder Unit	1	VEG0126	
261	6(4-I)	Rear Angle	1	VMA2687	
262	6(2-D,1-E, 4-E,3-I)	Cushion Rubber	4	VMA2610	
263	6(5-G)	Plastic Edge	1	VME0029	
266	2(8-D)	Rewind Arm Spring	1	VMB0467	
267		Protector	2	VMA3106	
268		Ring (E-type)	1	VMS1382	
269		Clamper	1	VJR3	
270	2(5-A)	Charge Slide Lever A	1	VXA0953	
271	6(5-B)	Left Corner Angle	1	VMA2610	
272	7(2-I)	Connecting Pulley Angle	1	VMA3512	
273	7(1-I)	Reel Sensor P.B. Angle	1	VMA3513	
274	7(6-G)	Output P.B. Angle	1	VMA3410	
(E)	7(6-G)	RF Envelope TP's P.C.Board	1	VEK0513	
275	1	A/C Head P.B. Bracket	1	VMA2681	
276	5(1-E)	Shield Case	1	VSC0391	
277	7	Transistor Head Sink	1	VSC0381	
(E)	7(6-B)	Power TR P.C.Board	1	VEK0514	
(E)	7	Power Transistor	1	2SA768	
278	7(6-C)	Transistor Holder	1	TES7151	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
279	10(2-A)	Cassette Tape	1	NV-T60-P	
280	10(2-A)	300 Ohm Internal Jack	1	VJH0091	
281	10(2-A)	F-Type Connector	1	VSQ0051	
282	5(2-C)	Micro Switch	1	VSM0027	
283	5(2-C)	Micro Switch Bracket	1	VMA2598	
284	5(2-C)	Micro Switch Fiber	1	VMA5377	
285	10(2-A)	Dust Cover	1	VYCS0001	
401		Screw with Washer (3ø×4mm)	1	XYN3+C4	
402	1,2,3,5,7,8	Tapping Screw (3ø×8mm)	54	XTV3+8FFXS	
403		Hex. Screw (3ø×4mm)	1	XXE3D4FXKS	
404	5	Screw (3ø×12mm)	2	XSN3+12FXS	
405	1,5,7,8	Screw with Washer (3ø×6mm)	18	XYN3+C6FXS	
406		Screw with Washer (3ø×4mm)	1	XYN3+C4FXS	
407	1	Screw with Washer (2ø×6mm)	2	XYN2+C6FX	
408	1,9	Screw with Washer (3ø×8mm)	5	XYN3+F8FXS	
409	1,3,9	Screw with Washer (3ø×10mm)	11	XYN3+F10FXS	
410	1,3,5,6,7,9	Tapping Screw (3ø×6mm)	49	XYV3+6FFXS	
411	2	Bolt with Hex. Head (3ø)	1	XVE3AFX	
412	2	Screw with Washer (3ø×8mm)	1	XSN3+8FXS	
413	5	Screw with Washer (2ø×10mm)	2	XYN2+C10FX	
414	3,4,5	Screw with Washer (3ø×6mm)	8	XYN3+F6FXS	
415	2	2 Point Hex. Screw (3ø×3mm)	1	XXE3D3FXKS	
416	1,2,5	Hex. Screw (2ø Point)	2	XXE3D4FXKS	
417	3	Hex. Screw (2ø×2.5mm)	1	XXE2D2FXKS	
418	1	Screw with Washer (3ø×12mm)	3	XYN3+C12FXS	
419		Tapping Screw (3ø×12mm)	1	XTS3H2BFX	
420	7	Tapping Screw (3ø×12mm)	1	XTV3+12BFX	
421	7,8	Tapping Screw (3ø×8mm)	1	XYV3+8BFXS	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
422		Screw with Washer (3ø×10mm)	1	XYN3+10FXS	
423	8	Screw with Washer (2.6ø×6mm)	4	XYN26+C6FXS	
424	9	Screw with Washer (3ø×6mm)	4	XYN3+F6FZS	
425	3,9	Screw with Washer (3ø×8mm)	3	XYN3+B8FXS	
426	9	Bind Screw (3ø×6mm)	4	XSB3+6FXKS	
427	9	Bind Screw (4ø×12mm)	4	XSB4+12FXXS	
428	8,9	Bind Screw (3ø×12mm)	10	XSB3+12FXXS	
429	6,9	Tapping Screw (3ø×6mm)	11	XTV3+6FFXRS	
430		Screw with Washer (3ø×8mm)	1	XYN3+C8FXS	
431	7	Tapping Screw (3ø×10mm)	4	XTV3+10FXS	
432		Tapping Screw (3ø×10mm)		XTV3+10BFX	
433		Screw with Washer (3ø×6mm)		XYN3+C6FX	
434	7	Screw with Washer (2.6ø×4mm)	4	XYN26×C4FX	
435		Bind Screw (3ø×12mm)		XSB3+12FXXS	
436	7	Screw with Washer (4ø×8mm)	4	XYN4+F8FXS	
437	5	Screw with Washer (4ø×25mm)	4	XYN4+C25FXS	
438		Tapping Screw (4ø×6mm)		XTV4+6FFXS	
439	1	Screw (3ø×10mm)	2	XSN3+10BWS	
440	5	Screw (4ø×15mm)		XSN4+15FXKS	
441	6,7	Tapping Screw (3ø×6mm)	8	XTN3+6FFXS	
442	9	Screw with Washer (3ø×12mm)	2	THE747	
443		Screw (3ø×6mm)		XYN3+F6F2S	
445		Screw (3ø)		XVE3AFXS	
446		Screw with Washer (3ø×8mm)		XYN3+8FXS	
451	3,9	Toothed Lock Washer (3ø)	3	XWC3AF	
452	1,2,5	Poly Slider Washer (3ø)	6	XWXV3D	
453	1,2,3,5	Retaining Ring (3ø)	7	XUEV3FP	
454	1,2,3,5,6,8	Retaining Ring (4ø)	41	XUEV4FP	
455	5	Retaining Ring (E-Type 2.5ø)	1	XUC25FP	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
456	1	Poly Slider Washer (4ø)	1	XWXV4F9	
457		Spring Washer (3ø)		XWA3	
458	1,2,3,5,7	Toothed Lock Washer (3ø)	7	XWC3BF	
459	3,9	Retaining Ring (E-Type 3)	6	XUE3FP	
460	9	Retaining Ring (E-Type 4)	2	XUC4FP	
461		Slide Washer A		VMX0122	
462	1,2,3,6,8	Washer (4, X=0.5)	34	XWXV4D9	
463	3,5	Washer (4, X=0.5)	6	XWXV4D65	
464	2,5	Washer (3, X=0.5)	4	XWXV3D54	
465	2	Retaining Ring (E-Type)	1	XUC2FP	
466	5	Retaining Ring (E-Type)	2	XUC5FP	
467	3	Washer	2	XWXV4A65	
468	3	Washer	2	XWXV4Z65	
469	7	Washer (2ø)	4	XWXV2D	
470	7	Retaining Ring (2ø)	3	XUEV2FP	
471		Toothed Lock Washer (4ø)		XWC4CF	
472		Toothed Lock Washer (3ø)		WC3CF	
473		Washer (2ø)		XBXV2D	
474	1	Washer (3ø)	2	XWG3BW	
475	8	Washer (6ø)	1	XWG6	

Item No.	Drawing No. & Location	Description	Pcs/ Set	Part No.	Remark
		SERVICING JIGS & TOOLS			
		VHS Alignment Tape		VFM8080H4	
		Back Tension Meter			
		Dial Torque Gauge		VFK0133	
		Adaptor For Dial Torque Gauge		VFK0134	
		Eccentric Screwdriver		VFK0135	
		Fine Adj Screwdriver (3ø)		VFK0136	
		Fine Adj Screwdriver (2.2ø)		VFK0157	
		Post Adj Screwdriver		VFK0137	
		Post Adj Plate		VFK0138	
		Reel Table Height Adj		VFK0139	
		Cassette Lock Arm Adj		VFK0140	
		Capstan Reference Plate		VFK0141	
		Cassette Holder		VFK0142	
		V Stopper Adj Jig		VFK0143	
		Retaining Ring Remover (3ø)		VFK0144	
		Retaining Ring Remover (4ø)		VFK0145	
		Hex Wrench (0.9ø)		VFK0146	
		Hex Wrench (1.25ø)		VFK75	
		Hex Wrench (1.5ø)		VFK76	
		Head Cleaning Stick		VFK27	
		Fan Type Tension Gauge		VFK66	
		Morytone Grease		MOR265	
		Cassette Tape Holder		VFK0148	

ELECTRICAL REPLACEMENT PARTS LIST

Model No. PV-1100

Note:

1. Be sure to make your orders of replacement parts according to this list.
2. IMPORTANT SAFETY NOTICE
   Components identified by shade have special characteristics important for safety. When replacing any of these components, use only the original ones.
3. Unless otherwise specified;
   All resistors are in OHMS (Ω), 1/4w, ±5% carbon, K=1,000Ω, M=1,000KΩ.
   All capacitors are in MICROFARADS (μF), ±10%, P=μμF.
   All coils are in MICROHENRIES (μH), m=10³μ.
4. C.B.A: Circuit Board Assembly.
5. C.B: Circuit Board.

Ref. No.		Part No.	Part Name & Description		Remarks
		VEP0156A	POWER SUPPLY C.B.A	1	
		VEP0665A1	REGULATOR & TRANSPORT C.B.A	1	
		VEP0283B	SERVO C.B.A	1	
		VEP0370A	LUMINANCE PROCESS C.B.A	1	
		VEP0843A	CHROMINANCE PROCESS C.B.A	1	
		VEP0441A	AUDIO C.B.A	1	
		VEP0708A	TV DEMODULATOR C.B.A	1	
		VEH0086	AUDIO HEAD CONNECTION C.B.A	1	
		VEK0502	RF CONVERTER CONNECTION C.B.A	1	
		VEJ0181	REAR JACK CONNECTION C.B.A	1	
		VEK0503	REEL SENSOR C.B.A	1	
		VEK0504	TAPE SLACK SWITCH C.B.A	1	
		VEK0509	SUPPLY PHOTO TR CONNECTION C.B.A	1	
		VEK0510	TAKE UP PHOTO TR CONNECTION C.B.A	1	
		VEK0506	SENSOR LAMP C.B.A	1	
		VEK0507	LOADING/UNLOADING COMPLETION SWITCHES C.B.A	1	
		VEK0511	CAPSTAN MOTOR C.B.A	1	
		VEK0513	RF ENVELOPE TP'S C.B.A	1	
		VEK0514	POWER TR C.B.A	1	
		VEP00228A	MEMORY SWITCH C.B.A	1	
		VES0100	LP/SP SELECT SW C.B.A	1	
		VEP00231A	TV/CAMERA INPUT SELECTOR C.B.A	1	
		VEP00227A	MIC JACK CONNECTION C.B.A	1	
		VEP00235A	AFC LAMP C.B.A	1	
		VEP00236A	LIGHT EMITTING DIODE C.B.A	1	
		VEP00240A	ANTENNA SELECTOR C.B.A	1	
		VEP00238A	LOADING MOTOR CONNECTION C.B.A	1	
		VEP00239A	AUDIO/CONTROL HEAD CONNECTION C.B.A	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			POWER SUPPLY C.B.A		
			Diodes		
D101		10 DCIR or MI-152R	Si	1	
D102,103		10 DCIN or MI-152	Si	2	
D104		10 DCIR or MI-152R	Si	1	
D105,106		MA150 or 1SS53	Si	2	
			Resistors		
R101		ERC12ZGK275	Solid 1/2W 2.7M	1	
R102		ERD25TJ222	2.2K	1	
R103		ERD25TJ103	10K	1	
			Capacitors		
C101		ECQU1A473MC	Across the line 125V 0.047	1	
C102—105		ECKW1H103PF	Ceramic 50V 0.01	4	
C106		ECEA1ES222	Electrolytic 25V 2200	1	
C107		ECEA1ES332	Electrolytic 25V 3300	1	
			Coil		
L101		ELF18D302V or VTQ0005	Line Filter	1	
			Miscellaneous		
F101		XBA1F10NU14A	Fuse 1A	1	
F102		XBA1F40NU14A	Fuse 4A	1	
		VJC6319	Fuse Holder	4	
		TJE98101	Check Terminal	11	
P11		VJP0091	10 Pin Connector	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
REGULATOR & TRANSPORT C.B.A					
			Transistors		
Q601,602		2SA564(Q,R)	Si PNP	2	
Q603		2SC1684(Q,R)	Si NPN	1	
Q604		2SC1317(Q,R)	Si NPN	1	
Q605		2SC1847V(Q,R)	Si NPN	1	
Q606,607		2SA886V(Q,R)	Si PNP	2	
Q608		2SC1847V(Q,R)	Si NPN	1	
Q608		2SC1317(Q,R)	Si NPN	1	
Q610—612		2SC1684(Q,R)	Si NPN	3	
Q613		2SA564(Q,R)	Si PNP	1	
Q614		2SC644(S,T)	Si NPN	1	
Q615,616		2SC1684(Q,R)	Si NPN	2	
Q617		2SC2497(Q,R)	Si NPN	1	
Q618		2SC1318(Q,R)	Si NPN	1	
Q619,620		2SC1684(Q,R)	Si NPN	2	
Q621		2SC1317(Q,R)	Si NPN	1	
Q622		2SC2497(Q,R)	Si NPN	1	
Q623		2SA719(Q,R)	Si PNP	1	
Q624		2SC1684(Q,R)	Si NPN	1	
Q625		2SC1847V(Q,R)	Si NPN	1	
Q626—628		2SC1684(Q,R)	Si NPN	3	
Q629		2SC1318(Q,R)	Si NPN	1	
Q630,631		2SC1684(Q,R)	Si NPN	2	
Q632		2SC644(S,T)	Si NPN	1	
Q633,634		2SC1684(Q,R)	Si NPN	2	
			Diodes		
D601—617		MA150 or 1SS53	Si	17	
D618		RD6.2EB or MA1062LF	Zener	1	
D619		MA150 or 1SS53	Si	1	
D620		10E1 or ERB12-01	Si	1	
D621—623		MA150 or 1SS53	Si	3	
D624		10E1 or ERB12-01	Si	1	
D625		1S954		1	
D626		10E1 or ERB12-01	Si	1	
D627,628		MA150 or 1SS53	Si	2	
D629		RD6.2EB or MA1062LF	Si	1	
D630		MA150 or 1SS53	Si	1	
D632,633		MA150 or 1SS53	Si	2	
D635		MA150 or 1SS53	Si	1	
D636		VD1222		1	
D637,638		MA150 or 1SS53	Si	2	
			Resistors		
R601		ERD25TJ223	22K	1	
R602		ERD25TJ222	2.2K	1	
R603		ERD25TJ221	220	1	
R604		ERD25TJ333	33K	1	
R605		ERD25TJ274	270K	1	
R606		ERD25TJ684	680K	1	
R607		ERD25TJ562	5.6K	1	
R608		ERD25TJ333	33K	1	
R609		ERD25TJ103	10K	1	
R610		ERD25TJ333	33K	1	
R611		ERD25TJ274	270K	1	
R612		ERD25TJ684	680K	1	
R613		ERD25TJ562	5.6K	1	
R614		ERD25TJ333	33K	1	
R615		ERD25TJ682	6.8K	1	
R616		ERD25TJ103	10K	1	
R617		ERD25TJ683	68K	1	
R618		ERD25TJ223	22K	1	
R619		ERD25TJ222	2.2K	1	
R620		ERD25TJ153	15K	1	
R621		ERD25TJ332	3.3K	1	
R623		ERD25TJ224	220K	1	
R624		ERD25TJ472	4.7K	1	
R625		ERD25TJ332	3.3K	1	
R626		ERD25TJ272	2.7K	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R627,628		ERD25TJ102	1K	2	
R629		ERD50TJ471C	1/2W 470	1	
R630		ERG2ANJ620H	Non-Flammable 2W 62	1	
R631		ERD25TJ102	1K	1	
R632		ERD50TJ471C	1/2W 470	1	
R633		ERD25TJ102	1K	1	
R634		ERD25TJ272	2.7K	1	
R635		ERQ2CJ4R7	Fuse 2W 4.7	1	
R636		ERD25TJ332	3.3K	1	
R637,638		ERD25TJ472	4.7K	2	
R639		ERD25TJ102	1K	1	
R640		ERD25TJ223	22K	1	
R641		ERD25TJ683	68K	1	
R642		ERD25TJ103	10K	1	
R643		ERD25TJ683	68K	1	
R644		ERD25TJ223	22K	1	
R645		ERD25TJ103	10K	1	
R646		ERD25TJ222	2.2K	1	
R647		ERD25TJ333	33K	1	
R648		ERD25TJ273	27K	1	
R649		ERD25TJ221	220	1	
R650		ERD25TJ272	2.7K	1	
R651		ERD25TJ103	10K	1	
R652		ERD25TJ683	68K	1	
R654		ERD25TJ683	68K	1	
R655		ERD25TJ221	220	1	
R656		ERD25TJ153	15K	1	
R657		ERD25TJ472	4.7K	1	
R658		ERD25TJ333	33K	1	
R659		ERD25TJ103	10K	1	
R660		ERD50TJ182C	1/2W 1.8K	1	
R661		ERD25TJ682	6.8K	1	
R662		ERD25TJ223	22K	1	
R663		ERG3ANJ121H	Metal Oxide 3W 120	1	
R664		ERD25TJ152	1.5K	1	
R665		ERD25TJ471	470	1	
R666		ERD25TJ222	2.2K	1	
R667		ERD25TJ333	33K	1	
R668—670		ERD25TJ103	10K	3	
R671		ERD25TJ332	3.3K	1	
R672		ERD50TJ561C	1/2W 560	1	
R673		ERD25TJ331	330	1	
R674		ERD25TJ332	3.3K	1	
R675		ERD25TJ682	6.8K	1	
R676		ERD50TJ471C	1/2W 470	1	
R677		ERD25TJ103	10K	1	
R678		ERD25TJ222	2.2K	1	
R679		ERD25TJ102	1K	1	
R680		ERD25TJ562	5.6K	1	
R681		ERD25TJ221	220	1	
R682		ERG1ANJ620H	Non-Flammable 1W 62	1	
R683		ERD25TJ221	220	1	
R684		ERD25TJ331	330	1	
R685		ERD25TJ333	33K	1	
R686		ERD25TJ102	1K	1	
R687		ERD25TJ223	22K	1	
R688		ERD25TJ474	470K	1	
R689		ERD25TJ392	3.9K	1	
R690		ERD25TJ122	1.2K	1	
R691		ERD25TJ102	1K	1	
R692		ERD25TJ122	1.2K	1	
R693		EVLS6AA00B52	Variable 500	1	
R694		ERD25TJ152	1.5K	1	
R695		ERD50TJ821C	1/2W 820	1	
R696		ERD25TJ683	68K	1	
R698		ERD25TJ103	10K	1	
R699		ERD25TJ104	100K	1	
R6100		ERD25TJ333	33K	1	
R6101		ERD25TJ683	68K	1	
R6102		ERD25TJ333	33K	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R6103		ERD25TJ332	3.3K	1	
R6104,6105		ERD25TJ223	22K	2	
R6106,6107		ERD25TJ683	68K	2	
R6108		ERD25TJ333	33K	1	
R6109		ERD25TJ562	5.6K	1	
R6110,6111		ERD25TJ683	68K	2	
R6112,6113		ERD25TJ103	10K	2	
R6115		ERD25TJ123	12K	1	
R6116		ERD25TJ223	22K	1	
R6117		ERD50TJ182C	1/2W 1.8K	1	
			Capacitors		
C601		ECEA16V10L or ECEA1CS100	Electrolytic 16V 10	1	
C602		ECEA1ES4R7	Electrolytic 25V 4.7	1	
C603,604		ECKW1H103PE	Ceramic 50V 0.01	2	
C605		ECEA1ES4R7	Electrolytic 25V 4.7	1	
C606		ECEA16V10L or ECEA1CS100	Electrolytic 16V 10	1	
C607		ECEA1ES4R7	Electrolytic 50V 4.7	1	
C608		ECEA1S221	Electrolytic 16V 220	1	
C609		ECEA16V10L or ECEA1CS100	Electrolytic 16V 10	1	
C610		ECEA50ZR15	Electrolytic 50V 0.15	1	
C611		ECEA1CS220	Electrolytic 16V 22	1	
C612		ECKW1H103PE	Ceramic 50V 0.01	1	
C613		ECEA1ES470	Electrolytic 25V 47	1	
C614		ECKW1H271KB	Ceramic 50V 270	1	
C615		ECEA1CS101	Electrolytic 16V 100	1	
C617		ECEA1ES100	Electrolytic 25V 10	1	
C618		ECEA50ZR33	Electrolytic 50V 0.33	1	
C619		ECEA16V10L or ECEA1CS100	Electrolytic 16V 10	1	
			Miscellaneous		
S601—604		QSB0234	Leaf Switch	4	
P61		VJP0089	3 Pin Connector	1	
P62—65		VJP0091	10 Pin Connector	4	
		TJE98101	Check Terminal	16	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
		TEL312	GT Pin	2	
SERVO C.B.A					
			Integrated Circuits		
IC201		AN6340	Servo Phase Control	1	
IC202		AN6811	Monostable Multivibrator	1	
IC203		AN6341	Control Amp.	1	
			Transistors		
Q201		2SC327(S,T)	Si NPN	1	
Q202		2SA564(Q,R)	Si PNP	1	
Q203		2SC1684(Q,R)	Si NPN	1	
Q204		2SA721(S,T)	Si PNP	1	
Q205		2SA564(Q,R)	Si PNP	1	
Q206		2SC2497(Q,R)	Si NPN	1	
Q207		2SA564(Q,R)	Si PNP	1	
Q208		2SC2497(Q,R)	Si NPN	1	
Q209		2SA564(Q,R)	Si PNP	1	
Q210		2SC2497(Q,R)	Si NPN	1	
Q211		2SC1684(Q,R)	Si NPN	1	
Q212		2SA564A(Q,R)	Si PNP	1	
Q213		2SD636(Q,R)	Si NPN	1	
Q214		2SA564(Q,R)	Si PNP	1	
Q215		2SC1684(Q,R)	Si NPN	1	
Q216		2SC1327(S,T)	Si NPN	1	
Q217		2SC1684(Q,R)	Si NPN	1	
Q218		2SA564(Q,R)	Si PNP	1	
Q219		2SC1327(S,T)	Si NPN	1	
Q220		2SA721(S,T)	Si PNP	1	
Q221,222		2SA564(Q,R)	Si PNP	2	
Q223		2SC1684(Q,R)	Si NPN	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
Q224		2SA564(Q,R)	Si PNP	1	
Q225,226		2SC1684(Q,R)	Si NPN	2	
Q227		2SC1318(Q,R)	Si PNP	1	
Q228		2SA699(Q,R)	Si PNP	1	
Q229,230		2SC1684(Q,R)	Si NPN	2	
			Diodes		
D202—207		MA150TA	Si	6	
D208—210		MA150DD	Si	3	
D211—215		MA150TA	Si	5	
D217,218		MA150TA	Si	2	
D221—229		MA150TA	Si	9	
			Resistors		
R201		ERD25TJ562	5.6K	1	
R203		ERD25TJ332	3.3K	1	
R206		ERD25TJ222	2.2K	1	
R207,208		ERD25TJ105	100K	2	
R209		EVLS6AA00B54	Variable 50K	1	
R210		ERD25TJ682	6.8K	1	
R211		EVLS6AA00B54	Variable 50K	1	
R212		ERD25TJ682	6.8K	1	
R213		EVLS6AA00B15	Variable 100K	1	
R214		ERD25TJ393	39K	1	
R215		ERD25TJ472	4.7K	1	
R216		ERD25TJ103	10K	1	
R217		ERD25TG6802	±2% 68K	1	
R218		ERD25TG1803	±2% 180K	1	
R219		ERD25TJ332	3.3K	1	
R220		ERD25TG4701	±2% 4.7K	1	
R221		ERD25TJ271	270	1	
R222		ERD25TG2201	±2% 2.2K	1	
R223		EVLS6AA00B54	Variable 50K	1	
R224		ERD25TJ683	68K	1	
R225		ERD25TJ473	47K	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R226		ERD25TJ104	100K	1	
R227		ERD25TJ152	1.5K	1	
R228		ERD25TJ332	3.3K	1	
R229		ERC14GK155	Solid 1.5M	1	
R230		ERD25TJ562	5.6K	1	
R231,232		ERD25TJ332	3.3K	2	
R233		ERD25TJ103	10K	1	
R234		ERD25TJ822	8.2K	1	
R235		ERD25TJ104	100K	1	
R236		ERD25TJ103	10K	1	
R237		ERD25TJ223	22K	1	
R238		ERD25TJ333	33K	1	
R239		ERD25TJ392	3.9K	1	
R240		ERD25TJ681	680	1	
R241		ERD25TJ223	22K	1	
R242		ERX12ANJR82H	Metal Oxide 1/2W 0.82	1	
R243		ERD25TJ392	3.9K	1	
R244		ERD25TJ470	47	1	
R245		ERD25TJ223	22K	1	
R246		ERD25TJ682	6.8K	1	
R247		ERD25TJ470	47	1	
R248		ERD25TJ223	22K	1	
R249		ERD25TJ682	6.8K	1	
R250		ERD25TJ470	47	1	
R251		ERD25TJ471	470	1	
R252		ERD25TJ153	15K	1	
R253		ERD25TJ152	1.5K	1	
R254		ERD25TJ273	27K	1	
R255		ERD25TJ561	560	1	
R256		ERD25TJ681	680	1	
R257		ERD25TJ683	68K	1	
R258		ERD25TJ333	33K	1	
R259,260		ERD25TJ332	3.3K	2	
R261		ERD25TJ392	3.9K	1	
R262		EVLS6AA00B53	Variable 5K	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R263		ERD25TJ822	8.2K	1	
R264		ERD25TJ331	330	1	
R265		ERD25TJ330	33	1	
R266		ERD25TJ272	2.7K	1	
R267		ERD25TJ102	1K	1	
R268		ERD25TJ104	100K	1	
R269		ERD25TJ154	150K	1	
R270		EVLS6AA00B15	Variable 100K	1	
R271		ERD25TJ473	47K	1	
R272		ERD25TJ223	22K	1	
R273		ERD25TJ154	150K	1	
R274,275		ERD25TJ474	470K	2	
R278		ERD25TJ333	33K	1	
R279		ERD25TJ153	15K	1	
R280		ERD25TJ103	10K	1	
R283		ERD25TJ473	47K	1	
R285		ERD25TJ562	5.6K	1	
R286		ERD25TJ224	220K	1	
R287,288		ERD25TJ153	15K	2	
R289		ERD25TJ392	3.9K	1	
R291		ERD25TJ682	6.8K	1	
R292		ERD25TJ472	4.7K	1	
R295,296		ERD25TJ393	39K	2	
R297		ERD25TJ222	2.2K	1	
R298		ERD25TJ103	10K	1	
R299		ERD25TJ683	68K	1	
R2100,2101		ERD25TJ153	15K	2	
R2102		ERD25TG1803	±2% 180K	1	
R2103		ERC14GK685	Solid 6.8M	1	
R2104		ERD25TG1203	±2% 120K	1	
R2105		ERD25TJ682	6.8K	1	
R2106		ERD25TJ683	68K	1	
R2107		ERD25TG3901	±2% 3.9K	1	
R2108		ERD25TG2201	±2% 2.2K	1	
R2109,2110		ERD25TJ221	220	2	
R2111		ERD25TG8200	±2% 820	1	
R2112		ERD25TJ273	27K	1	
R2113		ERD25TJ104	100K	1	
R2114		ERD25TJ393	39K	1	
R2115		ERD25TJ224	220K	1	
R2116		EVLS6AA00B54	Variable 50K	1	
R2117		ERD25TJ823	82K	1	
R2118		ERD25TG1503	±2% 150K	1	
R2119		ERD25TJ474	470K	1	
R2120		ERD25TJ332	3.3K	1	
R2121		ERD25TJ103	10K	1	
R2122		ERD25TJ683	68K	1	
R2123		ERD25TJ472	4.7K	1	
R2124		ERD25TJ152	1.5K	1	
R2125		ERD25TJ104	100K	1	
R2126		ERD25TJ102	1K	1	
R2129		ERD25TJ104	100K	1	
R2131		ERD25TJ222	2.2K	1	
R2132		ERD25TJ472	4.7K	1	
R2133		ERD25TJ332	3.3K	1	
R2134		ERD25TJ471	470	1	
R2135		ERD25TJ823	82K	1	
R2136		EVLS6AA00B54	Variable 50K	1	
R2137		ERD25TJ184	180K	1	
R2138		ERD25TJ332	3.3K	1	
R2139		ERD25TJ392	3.9K	1	
R2140		ERD25TJ104	100K	1	
R2141		ERD25TJ154	150K	1	
R2142		ERD25TJ474	470K	1	
R2143		ERD25TJ105	100K	1	
R2144		ERD25TJ274	270K	1	
R2145		ERD25TJ154	150K	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Capacitors		
C201		ECQM1H472KZW	Mylar 50V 0.0047	1	
C202		ECEA50V1L	Electrolytic 50V 1	1	
C204		ECEA50ZR33	Electrolytic 50V 0.33	1	
C205,206		ECEA50V1L or ECEA1HS010B	Electrolytic 50V 1	2	
C207,208		ECQM1H563KZW	Mylar 50V 0.056	2	
C209		ECQM1H223KZ3	Mylar 50V 0.022	1	
C210,211		ECQM1H104KZW	Mylar 50V 0.1	2	
C212		ECEA16Z100	Electrolytic 16V 100	1	
C213		ECEA1CS221	Electrolytic 16V 220	1	
C214		ECEA50ZR22	Electrolytic 50V 0.22	1	
C215		ECEA1CS470B	Electrolytic 16V 47	1	
C216		ECEA1CS470	Electrolytic 16V 47	1	
C217,218		ECQM1H104KZW	Mylar 50V 0.1	2	
C219		ECQM1H683KZW	Mylar 50V 0.068	1	
C220		ECQM1H823KZW	Mylar 50V 0.082	1	
C221		ECEA50V1L or ECEA1HS010B	Electrolytic 50V 1	1	
C222		ECEA50ZR22	Electrolytic 50V 0.22	1	
C223		ECEA1ES4R7B	Electrolytic 25V 4.7	1	
C224		ECEA1HS010	Electrolytic 50V 1	1	
C225		ECEA50ZR68	Electrolytic 50V 0.68	1	
C226		ECQM1H473KZ3	Mylar 50V 0.047	1	
C227		ECEA50N1B	Electrolytic Non-polarity 50V 1	1	
C228		ECQM1H393KZ3	Mylar 50V 0.039	1	
C229		ECEA50N1	Electrolytic Non-polarity 50V 1	1	
C230		ECQM1H393KZ3	Mylar 50V 0.039	1	
C231		ECEA50N1B	Electrolytic Non-polarity 50V 1	1	
C232		ECEA50ZR1B	Electrolytic 50V 0.1	1	
C233		ECEA50ZR33	Electrolytic 50V 0.33	1	
C234		ECQM1H562KZ3	Mylar 50V 0.0056	1	
C235		ECEA1CS100B	Electrolytic 16V 10	1	
C236		ECQM1H153KZW	Mylar 50V 0.015	1	
C237		ECQM1H153KZ3	Mylar 50V 0.015	1	
C238		ECQM1H393KZW	Mylar 50V 0.039	1	
C239		ECEA1CS100B	Electrolytic 16V 10	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
C240		ECAM1H223KZ3	Mylar 50V 0.022	1	
C241		ECQM1H102KZ3	Mylar 50V 0.001	1	
C242		ECEA50ZR33	Electrolytic 50V 0.33	1	
C243,244		ECQM1H103KZ3	Mylar 50V 0.01	2	
C245		ECQM1H274JZW	Tantal 50V 0.0027	1	
C246		ECSF35ER33E	Tantal 35V 0.33	1	
C247		ECEA1CS100B	Electrolytic 16V 10	1	
C249		ECEA1ES4R7B	Electrolytic 250V 4.7	1	
C250		ECEA50V1L or ECEA1HS010B	Electrolytic 50V 1	1	
C251		ECKR1H103PF2	Ceramic 50V 0.01	1	
C252		ECEA1CS100B	Electrolytic 16V 10	1	
C253		ECSF35ER27KE	Tantal 35V 0.27	1	
C254,255		ECQM1H104KZW	Mylar 50V 0.1	2	
C256		ECEA1CS470B	Electrolytic 16V 47	1	
C257		ECEA1CS100B	Electrolytic 16V 10	1	
C258		ECQM1H563KZW	Mylar 50V 0.056	1	
C259		ECQM1H683KZW	Mylar 50V 0.058	1	
C260		ECQM1H104KZW	Mylar 50V 0.1	1	
C261		ECEA50V1L or ECEA1HS010B	Electrolytic 50V 1	1	
C262		TBD08X473M or VCY25473M		1	
C263		ECEA50ZR1	Electrolytic 50V 0.1	1	
C264		ECQM1H103KZW	Mylar 50V 0.01	1	
C265		ECQM1H274KZW	Mylar 50V 0.0027	1	
C266		ECQM1H683KZW	Mylar 50V 0.058	1	
C267		ECQM1H102KZW	Mylar 50V 0.001	1	
C268		ECQM1H103KZW	Mylar 50V 0.01	1	
			Coil		
L201		VLQ80F102K	Dummy 1m	1	
			Miscellaneous		
P21,22		VJP0091	10 Pin Connector	2	
P23		VJB0090	5 Pin Connector	1	
P24		VJP1069	12 Pin Connector	1	
		TJE98101	Check Terminal	19	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
LUMINANCE PROCESS C.B.A					
			Integrated Circuits		
IC301		AN6300	Luminance Signal Processor	1	
IC302		AN6320	Drop-out Compensator	1	
IC303		AN6321	Limiter	1	
			Transistors		
Q301		2SA564(Q,R)	Si PNP	1	
Q302—304		2SC828(Q,R)	Si NPN	3	
Q305		2SA564(Q,R)	Si PNP	1	
Q306—308		2SC828(Q,R)	Si NPN	3	
Q309		2SC1359(B)	Si NPN	1	
Q310		2SC828(Q,R)	Si NPN	1	
Q311		2SA564(Q,R)	Si PNP	1	
Q312		2SC828(Q,R)	Si NPN	1	
Q313—315		2SC1317	Si NPN	3	
Q316		2SC828(Q,R)	Si NPN	1	
Q317		2SA564(Q,R)	Si PNP	1	
Q318		2SC828(Q,R)	Si NPN	1	
Q319		2SA564(Q,R)	Si PNP	1	
Q320—325		2SC828(Q,R)	Si NPN	6	
Q326		2SA564(Q,R)	Si PNP	1	
Q327,328		2SC828(Q,R)	Si NPN	2	
Q329		2SC1047(C,D)	Si NPN	1	
Q330—332		2SC828(Q,R)	Si NPN	3	
			Diodes		
D301—303		MA150TA	Si	3	
D304,305		ISS16	Si	2	
D306,307		MA150TA	Si	2	
D308		OA90	Ge	1	
D309		MA150TA	Si	1	
D310		OA90	Ge	1	
D311		MA150TA	Si	1	
D312		MA150	Si	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Resistors		
R301		ERD25TJ331	330	1	
R302		ERD25TJ152	1.5K	1	
R303		ERD25TJ102	1K	1	
R304		ERD25TJ124	120K	1	
R306		ERD25TJ122	1.2K	1	
R307		ERD25TJ102	1K	1	
R310		ERD25TJ102	1K	1	
R311		ERD25TJ472	4.7K	1	
R312,313		ERD25TJ103	10K	2	
R314		ERD25TJ122	1.2K	1	
R315		EVLS6AA00B53	Variable 5K	1	
R316		ERD25TJ271	270	1	
R317		ERD25VJ332	3.3K	1	
R318		ERD25VJ272	2.7K	1	
R319		ERD25TJ152	1.5K	1	
R320		ERD25VJ392	3.9K	1	
R321		ERD25VJ332	3.3K	1	
R322		ERD25TJ122	1.2K	1	
R323—325		ERD25TJ153	15K	3	
R326		ERD25TJ561	560	1	
R327		ERO25CKG2201	Metal 220	1	
R328		ERD25TJ102	1K	1	
R329		ERD25TJ391	390	1	
R330		ERD25VJ222	2.2K	1	
R331		ERD25VJ272	2.7K	1	
R332		ERD25TJ103	10K	1	
R333		EVLS6AA00B53	Variable 5K	1	
R334		ERD25VJ182	1.8K	1	
R335		ERD25VJ332	3.3K	1	
R336		EVLS6AA00B53	Variable 5K	1	
R337		ERD25TJ123	12K	1	
R338		ERD25TJ223	22K	1	
R339		ERD25TJ103	10K	1	
R340		ERD25TJ103	10K	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R341		ERD25TJ154	150K	1	
R342		ERD25TJ823	82K	1	
R343		ERD25TJ224	220K	1	
R344		EVLS6AA00B53	Variable 5K	1	
R345,346		ERD25TJ823	82K	2	
R347		ERD25VJ332	3.3K	1	
R348		ERD25TJ103	10K	1	
R349		EVLS6AA00B52	Variable 500	1	
R350		ERD25TJ820	82	1	
R351,352		ERD25TJ561	560	2	
R353		ERD25TJ223	22K	1	
R354		ERD25TJ103	10K	1	
R355		ERD25TJ222	2.2K	1	
R356		ERD25TJ393	39K	1	
R357		ERD25TJ103	10K	1	
R358—360		ERD25TJ102	1K	3	
R361		ERD25VJ392	3.9K	1	
R362		ERD25TJ123	12K	1	
R363		ERD25TJ562	5.6K	1	
R364		ERD25TJ183	18K	1	
R365		ERD25TJ102	1K	1	
R366		ERD25TJ101	100	1	
R367		ERD25VJ332	3.3K	1	
R368		ERD25TJ152	1.5K	1	
R369		ERD25TJ182	1.8K	1	
R370		ERD25TJ4R7	4.7	1	
R371		ERD25TJ102	1K	1	
R372		ERD25TJ470	47	1	
R373,374		ERD25VJ332	3.3K	2	
R375		ERD25TJ102	1K	1	
R376		ERD25TJ470	47	1	
R377		ERD25TJ100	10	1	
R378		ERD25TJ681	680	1	
R379		ERD25TJ103	10K	1	
R380		ERD25VJ272	2.7K	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R381		ERD25TJ271	270	1	
R382		ERD25TJ182	1.8K	1	
R383		ERD25TJ100	10	1	
R384		ERD25TJ473	47K	1	
R385		ERD25TJ182	1.8K	1	
R386		ERD25TJ100	10	1	
R387		ERD25TJ473	47K	1	
R388		ERD25TJ273	27K	1	
R389		EVLS6AA00B13	Variable 1K	1	
R390		ERD25TJ822	8.2K	1	
R391		EVLS6AA00B23	Variable 2K	1	
R392		ERD25TJ822	8.2K	1	
R393		EVLS6AA00B13	Variable 1K	1	
R394		ERD25TJ473	47K	1	
R395		ERD25TJ471	470	1	
R396		ERD25TJ102	1K	1	
R397		ERD25TJ472	4.7K	1	
R398		ERD25TJ822	8.2K	1	
R399		ERD25TJ152	1.5K	1	
R3100		ERD25TJ102	1K	1	
R3101		ERD25TJ331	330	1	
R3102		ERD25TJ470	47	1	
R3103		ERD25TJ102	1K	1	
R3104		ERD25VJ332	3.3K	1	
R3105		ERD25TJ102	1K	1	
R3106		ERD25VJ222	2.2K	1	
R3107		ERD25TJ102	1K	1	
R3108		ERD25TJ101	100	1	
R3109		ERD25VJ222	2.2K	1	
R3110,3111		ERD25TJ391	390	2	
R3112		ERD25TJ183	18K	1	
R3113		EVLS6AA00B15	Variable 100K	1	
R3114		ERD25TJ183	18K	1	
R3115		ERD25TJ821	820	1	
R3116		ERD25TJ471	470	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R3117		ERD25TJ182	1.8K	1	
R3118		EVLS6AA00B23	Variable 2K	1	
R3119		ERD25TJ122	1.2K	1	
R3120		ERD25TJ152	1.5K	1	
R3121		ERD25TJ473	47K	1	
R3122		ERD25VJ222	2.2K	1	
R3123		ERD25TJ105	1M	1	
R3125		ERD25TJ223	22K	1	
R3126		ERD25TJ221	220	1	
R3127		ERD25TJ122	1.2K	1	
R3128		ERD25VJ332	3.3K	1	
R3129,3130		ERD25TJ152	1.5K	2	
R3131		ERD25TJ562	5.6K	1	
R3132		ERD25TJ472	4.7K	1	
R3133		ERD25TJ101	100	1	
R3134		ERD25TJ102	1K	1	
R3135		ERD25TJ681	680	1	
R3136		ERD25TJ561	560	1	
R3137		ERD25VJ222	2.2K	1	
R3138		ERD25TJ561	560	1	
R3139		ERD25VJ182	1.8K	1	
R3140		ERD25TJ473	47K	1	
R3141,3142		ERD25TJ333	33K	2	
R3143		ERD25TJ103	10K	1	
R3144,3145		ERD25TJ333	33K	2	
R3147		ERD25TJ562	5.6K	1	
R3148		ERD25TJ561	560	1	
R3149		ERD25TJ681	680	1	
R3150		ERD25TJ474	470K	1	
R3151		ERD25TJ562	5.6K	1	
R3152		ERD25TJ103	10K	1	
R3153		ERD25TJ391	390	1	
R3154		ERD25TJ471	470	1	
R3155		ERD25TJ102	1K	1	
R3156		ERD25TJ821	820	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R3157		ERD25VJ222	2.2K	1	
R3158		ERD25TJ102	1K	1	
R3159		ERD25VJ222	2.2K	1	
R3160		ERD25TJ561	560	1	
R3161		ERD25TJ152	1.5K	1	
R3162		ERD25TJ102	1K	1	
R3163		ERD25TJ273	27K	1	
R3164		ERD25TJ153	15K	1	
R3165		ERD25TJ221	220	1	
R3166		ERD25TJ102	1K	1	
R3167		ERD25TJ821	820	1	
R3168		ERD25VJ392	3.9K	1	
R3169		ERD25TJ822	8.2K	1	
R3170		ERD25TJ221	220	1	
R3171		ERD25TJ102	1K	1	
R3172		ERD25TJ221	220	1	
R3172		ERD25TJ473	47K	1	
R3174		ERD25TJ471	470	1	
R3175		ERD25TJ562	5.6K	1	
R3176		ERD25TJ122	1.2K	1	
R3177		ERD25TJ102	1K	1	
R3178		ERD25TJ473	47K	1	
R3179		ERD25TJ121	120	1	
R3180		ERD25TJ562	5.6K	1	
R3181		ERD25TJ122	1.2K	1	
R3182		ERD14FJ820	Non-Flammable 82	1	
R3183		ERD25TJ103	10K	1	
R3184		ERD25TJ562	5.6K	1	
R3185,3186		ERD25TJ561	560	2	
R3187		ERD25TJ152	1.5K	1	
R3188		EVLS6AA00B13	Variable 1K	1	
R3189		ERD25VJ392	3.9K	1	
R3190		ERD25VJ392	3.9K	1	
R3191		ERD25TJ681	680	1	
R3192		ERD25TJ121	120	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R3193		ERD25TJ271	270	1	
R3194		ERD25VJ332	3.3K	1	
			Capacitors		
C301		ECEA1CS220	Electrolytic 16V 22	1	
C302		ECEA0JS470	Electrolytic 6V 47	1	
C303		ECEA6N47Z	Electrolytic Non-polarity 6V 47	1	
C304		ECEA50ZR1	Electrolytic 50V 0.1	1	
C305		TBD08X473M	Semiconductor	1	
C306		ECQM1H333KZW	Mylar 50V 0.033	1	
C307		ECEA1AS221	Electrolytic 10V 220	1	
C308		ECCR1H101KC	Ceramic 50V 100P	1	
C309		ECEA0JS470	Electrolytic 6V 47	1	
C310		ECQM1H472KZW	Mylar 50V 0.0047	1	
C311		ECEA1CS470B	Electrolytic 16V 47	1	
C312		ECEA6N47Z	Electrolytic Non-polarity 6V 47	1	
C313		ECKR1H331KB	Ceramic 50V 330P	1	
C314		ECKW1H331KB	Ceramic 50V 330P	1	
C315		ECCW1H390KC	Ceramic 50V 39P	1	
C316		ECEA1S010 or ECEAS0V1L	Electrolytic 50V 1	1	
C317		ECKW1H331KB	Ceramic 50V 330P	1	
C318		ECEA1CS221	Electrolytic 16V 220	1	
C319		ECEA25N4R7B	Electrolytic Non-polarity 25V 4.7	1	
C320		ECEA1CS470	Electrolytic 16V 47	1	
C321		ECKW1H103PF	Ceramic 50V 0.01	1	
C322		ECEA1CS470	Electrolytic 16V 47	1	
C323		ECKR1H103PF	Ceramic 50V 0.01	1	
C324		ECV1ZW50X44	Trimer 50P	1	
C325		ECKR1H103PF	Ceramic 50V 0.01	1	
C326		ECEA0JS101	Electrolytic 6V 100	1	
C327		ECKW1H103PF	Ceramic 50V 0.01	1	
C328		ECCW1H910JC	Ceramic 50V 91P	1	
C329		ECKW1H103PF	Ceramic 50V 0.01	1	
C330		ECKR1H103PF	Ceramic 50V 0.01	1	
C331		ECKR1H331KB	Ceramic 50V 330P	1	
C332		ECCW1H680KC	Ceramic 50V 68P	1	
C333		ECCR1H100D	Ceramic 50V 10P	1	
C334		ECQM1H102KZW	Mylar 50V 0.001	1	
C335		ECQM1H333KZW	Mylar 50V 0.033	1	
C336		ECCW1H120KC	Ceramic 50V 12P	1	
C337		ECCR1H100B	Ceramic 50V 10P	1	
C338		ECKR1H103PF	Ceramic 50V 0.01	1	
C339		ECKR1H103PF	Ceramic 50V 0.01	1	
C340		ECKR1H103PF	Ceramic 50V 0.01	1	
C341		ECEA1CS470	Electrolytic 16V 47	1	
C342		ECQM1H104KZW	Mylar 50V 0.1	1	
C343		ECEA1CS470B	Electrolytic 16V 47	1	
C344		ECEA1CS100B or ECEA16V10L	Electrolytic 16V 10	1	
C345		ECEA1CS470	Electrolytic 16V 47	1	
C346		ECKW1H103PF	Ceramic 50V 0.01	1	
C347,348		ECEA1HS010 or ECEA50V1	Electrolytic 50V 1	2	
C349		ECEA1CS100 or ECEA16V10L	Electrolytic 16V 10	1	
C350		ECKR1H103PF	Ceramic 50V 0.01	1	
C352		ECV1ZW50X44	Trimmer 50P	1	
C353		ECKR1H103PF	Ceramic 50V 0.01	1	
C354		ECCW1H150KC	Ceramic 50V 15P	1	
C355		ECV1ZW50X44	Trimmer 50P	1	
C356—358		ECKR1H103PF	Ceramic 50V 0.01	3	
C359		ECQM1H562KZW	Mylar 50V 0.0056	1	
C360		ECCR1H330KC	Ceramic 50V 33P	1	
C361		ECCW1H330KC	Ceramic 50V 33P	1	
C362		ECKR1H103PF	Ceramic 50V 0.01	1	
C364		ECKW1H331KB	Ceramic 50V 330P	1	
C365		ECEA1CS100B or ECEA16V10L	Electrolytic 16V 10	1	
C366		VCKC1H431JSA	Ceramic 50V 430P	1	
C367		ECCW1H560KC	Ceramic 50V 56P	1	
C368		ECKW1H103PF	Ceramic 50V 0.01	1	
C369		ECKR1H102KB	Ceramic 50V 0.001	1	
C370		ECKR1H103PF	Ceramic 50V 0.01	1	
C371		ECEA0JS470	Electrolytic 6V 47	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
C372		ECKW1H103PF	Ceramic 50V 0.01	1	
C373		ECCR1H101KC	Ceramic 50V 100P	1	
C374		ECQM1H182KZW	Mylar 50V 0.0018	1	
C375		ECCR1H330KC	Ceramic 50V 33P	1	
C376		ECKW1H103PF	Ceramic 50V 0.01	1	
C377		ECCR1H470KC	Ceramic 50V 47	1	
C378		ECCR1H680KC	Ceramic 50V 68	1	
C381		VCKC1H681JSA or TCCW1H681J	Ceramic 50V 680P	1	
C382		VCKC1H431JSA	Ceramic 50V 430P	1	
C383		ECEA1CS101	Electrolytic 16V 100	1	
C384		ECEA1CS470	Electrolytic 16V 47	1	
C385		ECCW1H181JC	Ceramic 50V 180P	1	
C386		ECEA1CS100 or ECEA16V10L	Electrolytic 16V 10	1	
C387		ECCR1H470KC	Ceramic 50V 47P	1	
C388		ECEA1CS470	Electrolytic 16V 47	1	
C389		ECEA0JS470	Electrolytic 6V 47	1	
C390		ECCR1H270JC	Ceramic 50V 27P	1	
C391		ECCW1H820KC	Ceramic 50V 82P	1	
C392		ECEA0JS470	Electrolytic 6V 47	1	
C393		ECEA1CS100B or ECEA16V10L	Electrolytic 16V 10	1	
C394		ECKW1H103PF	Ceramic 50V 0.01	1	
C395		ECEA1CS470B	Electrolytic 16V 47	1	
C396		ECEA1HS010 or ECEA50V1L	Electrolytic 50V 1	1	
C397		ECEA0JS470	Electrolytic 6V 47	1	
C398		ECEA0JS471	Electrolytic 6V 470	1	
C399		ECEA1AS471	Electrolytic 10V 470	1	
C3100		ECKR1H102KB	Ceramic 50V 0.001	1	
C3101		ECKW1H471KB	Ceramic 50V 470P	1	
C3102		ECCW1H101KC	Ceramic 50V 100P	1	
C3103		ECEA0JS101	Electrolytic 6V 100	1	
C3104		ECEA1CS470B	Electrolytic 16V 47	1	
C3105,3106		ECKR1H103PF	Ceramic 50V 0.01	2	
C3107		VCKC1H681JSA or TCCW1H681J	Ceramic 50V 680P	1	
C3108		ECKR1H103PF	Ceramic 50V 0.01	1	
C3109		ECCR1H820KC	Ceramic 50V 82P	1	
C3110,3111		ECKR1H103PF	Ceramic 50V 0.01	2	
C3112		ECEA1CS100B or ECEA16V10L	Electrolytic 16V 10	1	
C3113		ECEA1CS100 or ECEA16V10L	Electrolytic 16V 10	1	
C3114		ECKW1H103PF	Ceramic 50V 0.01	1	
C3115		ECEA1CS470	Electrolytic 16V 47	1	
C3116		ECCR1H680KC	Ceramic 50V 68P	1	
C3117		ECCW1H330KC	Ceramic 50V 33P	1	
C3118		ECCR1H390KC	Ceramic 50V 39P	1	
C3119		TBD08X473M	Semiconductor 0.047	1	
C3120,3121		ECCR1H680KC	Ceramic 50V 68P	2	
C3122		ECKR1H103PF	Ceramic 50V 0.01	1	
C3123		ECCW1H680KC	Ceramic 50V 68P	1	
C3124		ECKR1H103PF	Ceramic 50V 0.01	1	
C3125		ECKW1H103PF	Ceramic 50V 0.01	1	
C3126		TBD08X473M	Semiconductor 0.047	1	
C3127		ECCR1H820KC	Ceramic 50V 82P	1	
C3128		VCKC1H561JSA or TCCW1H561J	Ceramic 50V 560P	1	
C3129		ECEA0J470	Electrolytic 6V 47	1	
C3130		ECEA1CS470	Electrolytic 16V 47	1	
C3131		ECCW1H150KC	Ceramic 50V 15P	1	
C3132		ECCW1H220KC	Ceramic 50V 22P	1	
C3133		ECCW1H101KC	Ceramic 50V 100P	1	
			Coils		
L301		VLQ80F221K	220	1	
L302		VLQ80F470K	47	1	
L303		VLQ80F221K	220	1	
L304		VLQ80F151K	150	1	
L305		VLQ80F820K	82	1	
L306		VLQ80F101K	100	1	
L307		VLQ80F2R2K	2.2	1	
L308		VLQ80F270K	27	1	
L309		VLT0083	Dummy	1	
L310		VLQ80F2R2K	2.2	1	
L311		VLQ80F3R3K	3.3	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
L312,313		VLQ80F221K	220	2	
L314		VLQ80F151K	150	1	
L315		VLQ80F561K	560	1	
L316,317		VLQ80F100K	10	2	
L318		VLQ80F102K	1m	1	
L319,320		VLQ80F101K	100	2	
L321		VLQ80F221K	220	1	
L322—324		VLQ80F101K	100	3	
L325		VLQ80F220K	22	1	
L326		VLQ80F221K	220	1	
L327,328		VLQ80F470K	47	2	
L329		VLQ80F180K	18	1	
L330		VLQ80F470K	47	1	
L331		VLQ80F220K	22	1	
			IF Transformer		
T301		EIK10H8		1	
			Filters		
FL301		VLF0063		1	
FL302		VLF0064		1	
FL303		VLF0043-1		1	
FL304		VLF0061		1	
FL305		VLF0062		1	
FL306		VLF6		1	
FL307		VLF0065		1	
			Delay Line		
DL301		VLD0012 or EFDEN645A12B		1	
			Miscellaneous		
P31		VJP0089	3 Pin Connector	1	
P32—34		VJP0091	10 Pin Connector	3	
		TJE98101	Check Terminal	23	
		VSC0352	Shield Case	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
		VSC0354	Shield Case	1	
		VSC0353-1	Shield Case	1	
CHROMINANCE PROCESS C.B.A					
			Integrated Circuits		
IC801		AN305		1	
IC802		AN337		1	
IC803		MN6061A		1	
IC804		AN236		1	
IC805		AN6342		1	
			Transistors		
Q801—804		2SC828(Q,R)	Si NPN	4	
Q805		2SC1047(C,D)	Si NPN	1	
Q806—809		2SC828(Q,R)	Si NPN	4	
Q811—815		2SC828(Q,R)	Si NPN	5	
Q816,817		2SA564(Q,R)	Si PNP	2	
Q818		2SC828(Q,R)	Si NPN	1	
			Diodes		
D801,802		MA150	Si	2	
D803		OA90	Ge	1	
D804—809		MA150	Si	6	
			Resistors		
R802		ERD25TJ474	470K	1	
R803		ERD25TJ103	10K	1	
R804		ERD25TJ102	1K	1	
R805		ERD25TJ334	330K	1	
R806		ERD25TJ682	6.8K	1	
R807		EVLS6AA00B14	Variable 10K	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R808		EVLS6AA00B23	Variable 2K	1	
R809		ERD25TJ183	18K	1	
R810		ERD25TJ122	1.2K	1	
R811,812		ERD25TJ102	1K	2	
R813		ERD25TJ561	560	1	
R814		ERD25TJ222	2.2K	1	
R815		ERD25TJ152	1.5K	1	
R816,817		ERD25TJ273	27K	2	
R818		ERD25TJ332	3.3K	1	
R819		ERD25TJ333	3.3K	1	
R820		ERD25TJ123	12K	1	
R821		ERD25TJ471	470	1	
R822		ERD25TJ392	3.9K	1	
R823		ERD25TJ181	180	1	
R824		ERD25TJ151	150	1	
R825		ERD25TJ272	2.7K	1	
R826		ERD25TJ562	5.6K	1	
R827		ERD25TJ222	2.2K	1	
R828		ERD25TJ102	1K	1	
R829		ERD25TJ473	47K	1	
R830		ERD25TJ122	1.2K	1	
R831		ERD25TJ822	8.2K	1	
R832		ERD25TJ102	1K	1	
R833		ERD25TJ222	2.2K	1	
R834		ERD25TJ562	5.6K	1	
R835		ERD25TJ223	22K	1	
R836		ERD25TJ333	33K	1	
R837		ERD25TJ123	12K	1	
R838		ERD25TJ822	8.2K	1	
R839		EVLS6AA00B53	Variable 5K	1	
R840		EVLS6AA00B23	Variable 2K	1	
R841—843		ERD25TJ391	390	3	
R845,846		ERD25TJ391	390	2	
R847		ERD25TJ681	680	1	
R848		ERD25TJ181	180	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R850		ERD25TJ153	15K	1	
R853		ERD25TJ121	120	1	
R854		ERD25TJ564	560K	1	
R855		ERD25TJ101	100	1	
R856		ERD25TJ562	5.6K	1	
R857,858		ERD25TJ273	27K	2	
R859		ERD25TJ222	2.2K	1	
R860		EVLS6AA00B54	Variable 50K	1	
R861		ERD25TJ392	3.9K	1	
R862		ERD25TJ822	8.2K	1	
R863		ERD25TJ183	18K	1	
R864		ERD25TJ103	10K	1	
R865,866		ERD25TJ102	1K	2	
R867		ERD25TJ332	3.3K	1	
R868		ERD25TJ152	1.5K	1	
R869		EVLS6AA00B13	Variable 1K	1	
R870		ERD25TJ222	2.2K	1	
R871,872		ERD25TJ271	270	2	
R873		ERD25TJ333	33K	1	
R874		ERD25TJ152	1.5K	1	
R875		ERD25TJ271	270	1	
R876		ERD25TJ562	5.6K	1	
R877		ERD25TJ393	39K	1	
R878		ERD25TJ123	12K	1	
R879		ERD25TJ101	100	1	
R880		ERD25TJ153	15K	1	
R881		ERD25TJ473	47K	1	
R882		ERD25TJ472	4.7K	1	
R884		ERD25TJ152	1.5K	1	
R885		ERD25TJ471	470	1	
R886		ERD25TJ123	12K	1	
R887		ERD25TJ103	10K	1	
R888		ERD25TJ392	3.9K	1	
R889		ERD25TJ562	5.6K	1	
R890		ERD25TJ182	1.8K	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
R891		ERD25TJ392	3.9K	1	
R892		EVLS6AA00B54	Variable 50K	1	
R893		ERD25TJ223	22K	1	
R894		ERD25TJ682	6.8K	1	
R895		ERD25TJ560	56	1	
R896		ERD25TJ682	6.8K	1	
R897		ERD25TJ152	1.5K	1	
R898		ERD25TJ102	1K	1	
R899		ERD25TJ823	82K	1	
R8100		ERD25TJ152	1.5K	1	
R8101		ERD25TJ392	3.9K	1	
R8103		ERD25TJ272	2.7K	1	
R8104		ERD25TJ101	100	1	
R8105		ERD25TJ331	330	1	
R8106		EVLS6AA00B53	Variable 5K	1	
R8107		ERD25TJ151	150	1	
R8108		ERD25TJ331	330	1	
R8109		ERD25TJ153	15K	1	
R8110		ERD25TJ393	39K	1	
R8111		ERD25TJ122	1.2K	1	
R8112		ERD25TJ562	5.6K	1	
R8113		ERD25TJ102	1K	1	
R8114		ERD25TJ122	1.2K	1	
R8115		ERD25TJ103	10K	1	
R8116		ERD25TJ223	22K	1	
			Capacitors		
C801		ECKR1H103PF	Ceramic 50V 0.01	1	
C802		ECEA1CS100B	Electrolytic 16V 10	1	
C803,804		ECKR1H103PF	Ceramic 50V 0.01	2	
C805		ECCR1H470KC	Ceramic 50V 47	1	
C806		ECEA50ZR47	Electrolytic 50V 0.47	1	
C807		ECEA1CS100B	Electrolytic 16V 10	1	
C808		ECEA1CS100	Electrolytic 16V 10	1	
C809		ECCR1H470KC	Ceramic 50V 47P	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
C810,811		ECKR1H103PF	Ceramic 50V 0.01	2	
C812		ECKW1H103PF	Ceramic 50V 0.01	1	
C813		ECKR1H103PF	Ceramic 50V 0.01	1	
C814		ECKR1H681KB	Ceramic 50V 680P	1	
C815—818		ECKR1H103PF	Ceramic 50V 0.01	4	
C819		ECEA1CS100B or ECEA16V10L	Electrolytic 16V 10	1	
C820		ECKR1H103PF	Ceramic 50V 0.01	1	
C822		ECKW1H471KB	Ceramic 50V 470P	1	
C823		ECKR1H103PF	Ceramic 50V 0.01	1	
C824		ECEA1CS100B	Electrolytic 16V 10	1	
C825		ECKR1H103PF	Ceramic 50V 0.01	1	
C826		ECQM1H223KZW	Mylar 50V 0.022	1	
C827		TBD08X473M	Trimmer 50P	1	
C830		ECEA1CS100	Electrolytic 16V 10	1	
C831		ECCR1H560KC	Ceramic 50V 56P	1	
C832,833		ECKR1H391KB	Ceramic 50V 390P	2	
C834		ECEA1CS470	Electrolytic 50V 47P	1	
C836		ECQM1H152KZW	Mylar 50V 0.0015	1	
C837		ECAM1H103KZW	Mylar 50V 0.01	1	
C838		ECCR1H150KC	Ceramic 50V 15P	1	
C839		ECCR1H101KC	Ceramic 50V 100P	1	
C840		ECV1ZW20X32	Trimmer 20P	1	
C841		ECKW1H101KC	Ceramic 50V 100P	1	
C842		ECKR1H103PF	Ceramic 50V 0.01	1	
C843		ECEA1CS100B	Electrolytic 16V 10	1	
C844		ECEA1ES4R7	Electrolytic 50V 4.7	1	
C845		ECKR1H103PF	Ceramic 50V 0.01	1	
C846		ECCW1H101JL	Ceramic 50V 100P	1	
C847		ECCR1H101KC	Ceramic 50V 100P	1	
C848		ECKR1H103PF	Ceramic 50V 0.01	1	
C849		ECEA1CS100B	Electrolytic 16V 10	1	
C850		ECKW1H561KB	Ceramic 50V 560P	1	
C851		ECKR1H221KB	Ceramic 50V 220P	1	
C852		ECCW1H151KC	Ceramic 50V 150P	1	
C853		ECCR1H390KC	Ceramic 50V 39P	1	

Ref. No.	Part No.	Part Name & Description	Pcs / Set	Remarks
C854	ECKR1H103PF	Ceramic 50V 0.01	1	
C855,856	ECEA0JS470B	Electrolytic 6V 47	2	
C857	ECEA1CS100B	Electrolytic 16V 10	1	
C858	ECEA1CS470	Electrolytic 16V 47	1	
C859	ECKR1H103PF	Ceramic 50V 0.01	1	
C861	ECCR1H220KC	Ceramic 50V 22P	1	
C862	ECKR1H103PF	Ceramic 50V 0.01	1	
C863	ECEA1CS100	Electrolytic 16V 1P	1	
C864	ECKR1H103PF	Ceramic 50V 0.01	1	
C865	ECCR1H101KC	Ceramic 50V 100P	1	
C866	ECQM1H222KZW	Mylar 50V 0.0022	1	
C867	ECKW1H103PH	Ceramic 50V 0.01	1	
C868	ECKR1H103PF	Ceramic 50V 0.01	1	
C869,870	ECCR1H330JU	Ceramic 50V 33P	2	
C871	ECCW1H150JU	Ceramic 50V 15P	1	
C872	ECEA1CS100B	Electrolytic 16V 10	1	
C873	ECEA1ES4R7	Electrolytic 25V 4.7	1	
C874	ECEA50ZR1	Electrolytic 50V 0.1	1	
C875	ECQM1H222KZW	Mylar 50V 0.0022	1	
C877	ECCR1H680KC	Ceramic 50V 68P	1	
C878	ECEA50ZR33	Electrolytic 50V 0.33	1	
C879	ECQM1H333KZW	Mylar 50V 0.033	1	
C880	ECKR1H271KB	Ceramic 50V 270P	1	
C882	ECCR1H390KC	Ceramic 50V 39P	1	
C883	ECEA1CS470	Electrolytic 16V 47	1	
		Coils		
L801	VLQ80F390K	39	1	
L802,803	VLQ80F221K	220	2	
L804	VLQ80F180K	18	1	
L805	VLQ02F682K	6.8m	1	
L806,807	VLQ80F221K	220	2	
L808	VLQ80F3R9K	3.9	1	
L809	VLQ80F330K	33	1	
L810	VLQ80F100K	10	1	

Ref. No.	Part No.	Part Name & Description	Pcs / Set	Remarks
L811	VLQ80F221K	220	1	
L812,813	VLQ80F101K	100	2	
		Transformers		
T801	E1K-10S588D or VLT0096		1	
T802	VLT0097		1	
		Filters		
FL801	VLF6		1	
FL802	VLF0066		1	
FL803	VLF0067		1	
		Delay Line		
D801	EFDEN645B22A		1	
		Crystals		
X801	VSX0060 or VSX5		1	
X802	VSX5		1	
		Miscellaneous		
	TJE98101	Check Terminal	17	
		AUDIO C.B.A		
		Integrated Circuit		
IC401	AN262		1	
		Transistors		
Q401,402	2SC1684(Q,R)	Si NPN	2	
Q403,404	2SC1318(Q,R)	Si NPN	2	
Q405,406	2SC1684(Q,R)	Si NPN	2	
Q407	2SA719(Q,R)	Si PNP	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
Q408		2SA564(Q,R)	Si PNP	1	
Q409		2SC1684(Q,R)	Si NPN	1	
Q410		2SA564(Q,R)	Si PNP	1	
Q411,412		2SC1684(Q,R)	Si NPN	2	
Q413		2SA683(Q,R)	Si PNP	1	
Q414		2SC1684(Q,R)	Si NPN	1	
			Diodes		
D401—406		MA150 or 1SS53	Si	6	
D408,409		MA150 or 1SS53	Si	2	
			Resistors		
R401		ERD25TJ333	33K	1	
R402		ERD25TJ392	3.9K	1	
R403		ERD25TJ104	100K	1	
R404		EVLS6AA00B53	Variable 5K	1	
R405		EVLS6AA00B24	Variable 20K	1	
R406		ERD25TJ181	180	1	
R407		ERD25TJ182	1.8K	1	
R408		ERD25TJ151	150	1	
R409		ERD25TJ562	5.6K	1	
R410		ERD25TJ474	470K	1	
R411		ERD25TJ105	1M	1	
R412		ERD25TJ102	1K	1	
R413		ERD25TJ182	1.8K	1	
R414		ERD25TJ103	10K	1	
R415		ERD25TJ393	39K	1	
R416		ERD25TJ273	27K	1	
R417		ERD25TJ153	15K	1	
R418		ERD25TJ103	10K	1	
R419		ERD25TJ333	33K	1	
R420		ERD25TJ472	4.7K	1	
R421		ERD25TJ473	47K	1	
R422		ERD25TJ472	4.7K	1	
R423		ERD25TJ103	10K	1	
R424		ERD25TJ473	47K	1	
R425		ERD25TJ222	2.2K	1	
R426		ERD25TJ102	1K	1	
R427		ERD25TJ224	220K	1	
R428		ERD25TJ561	560	1	
R429		ERD25TJ273	27K	1	
R430		ERD25TJ333	33K	1	
R431		ERD25TJ561	560	1	
R432		ERD25TJ560	56	1	
R433		ERD25TJ4R7	4.7	1	
R434		ERD25TJ393	39K	1	
R435		ERD25TJ332	3.3K	1	
R436		ERD25TJ123	12K	1	
R438,439		ERD25TJ393	39K	2	
R440		ERD25TJ332	3.3K	1	
R441		ERD25TJ561	560	1	
R442		ERD25TJ272	2.7K	1	
R443		ERD25TJ103	10K	1	
R444		ERD25TJ333	33K	1	
R445		ERD25TJ221	220	1	
R446		ERD25TJ333	33K	1	
R447		ERD25TJ392	3.9K	1	
R448		ERD25TJ333	33K	1	
R449		ERD25TJ103	10K	1	
R450		ERD25TJ101	100	1	
R451		ERD25TJ103	10K	1	
R452		ERD25TJ333	33K	1	
R453		ERD25TJ223	22K	1	
R454		ERD25TJ183	18K	1	
R455,456		ERD25TJ103	10K	1	
R457,458		ERD25TJ473	47K	1	
R459		ERD25TJ223	22K	1	
R460		ERD25TJ103	10K	1	
R481		ERD25TJ332	3.3K	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Capacitors		
C401		ECKW1H561KB	Ceramic 50V 560P	1	
C402		ECEA0JS330	Electrolytic 6V 33	1	
C403,404		ECEA1CS100B	Electrolytic 16V 10	2	
C405		ECQM1H333KZW	Mylar 50V 0.033	1	
C406		ECKW1H103PF	Ceramic 50V 0.01	1	
C407		ECEA1CS100	Electrolytic 16V 10	1	
C408		ECKW1H102KB	Ceramic 50V 0.001	1	
C409		ECEA50ZR15	Electrolytic 50V 0.15	1	
C410		ECQM1H562KZW	Mylar 50V 0.0056	1	
C411		ECEA1HS010	Electrolytic 50V 1	1	
C412		ECEA1CS100B	Electrolytic 16V 10	1	
C413		ECEA1CS100	Electrolytic 16V 10	1	
C414		ECQM1H224KZW	Mylar 50V 0.22	1	
C415		ECEA1CS100B	Electrolytic 16V 10	1	
C416		ECEA1CS100	Electrolytic 16V 10	1	
C417		ECEA0JS101	Electrolytic 6V 100	1	
C418		ECEA1CS100B	Electrolytic 16V 10	1	
C419		ECKW1H103PF	Ceramic 50V 0.01	1	
C420,421		ECEA1CS100	Electrolytic 16V 10	2	
C422		ECEA50ZR22	Electrolytic 50V 0.22	1	
C423		ECEA1CS100	Electrolytic 16V 10	1	
C424		ECEA1CS100B	Electrolytic 16V 10	1	
C425		ECEA1CS221	Electrolytic 16V 220	1	
C426		ECEA1CS470B	Electrolytic 16V 47	1	
C427		ECKW1H103PF	Ceramic 50V 0.01	1	
C428		ECEA50ZR15	Electrolytic 50V 0.15	1	
C429		ECEA1CS470B	Electrolytic 50V 47	1	
C430		ECEA0JS101B	Electrolytic 6V 100	1	
C431		ECQM1H472KZW	Mylar 50V 0.0047	1	
C432		ECQM1H472KZW	Mylar 50V 0.0047	1	
C433		ECQF6H122KZ	Polypropylene 300V 0.0012	1	
C434		VCV0001	Ceramic Trimmer 70P	1	
C436,437		ECEA1CS470B	Electrolytic 50V 47	2	
C438		ECEA1HS010B	Electrolytic 50V 1	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
C439		ECKW1H561KBZ	Ceramic 50V 560P	1	
			Coils		
L401		VLQ80F102K	1m	1	
L402		VLQ80F222K	22m	1	
L403		VLQ80F102K	1m	1	
L404		VLT0099		1	
			Transformer		
T401		VLT0100	Bias OSC	1	
			Miscellaneous		
		TEJ98101	Check Terminal	3	
S401		VSS0036	Slide Switch	1	
S402		VSS0037	Slide Switch	1	
P41		VJP0089	3 Pin Connector	1	
P42		VJP0090	5 Pin Connector	1	
P43		VJP0091	10 Pin Connector	1	
P44		VJP0090	5 Pin Connector	1	
TV DEMODULATOR C.B.A					
			Integrated Circuits		
IC701		AN240P		1	
IC702		HA11220		1	
			Transistors		
Q702		2SC828(Q,R)	Si NPN	1	
Q703		2SC1684(Q,R)	Si NPN	1	
Q704		2SK55(C,D)		1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Resistors		
R701		ERD25TJ222	2.2K	1	
R703		ERD25TJ103	10K	1	
R704		ERD25TJ822	8.2K	1	
R705		EVLS6AA00B14	Variable 10K	1	
R706		ERD25TJ102	1K	1	
R707		ERD25TJ561	560	1	
R708		ERD25TJ271	270	1	
R709		ERD25TJ562	5.6K	1	
R710		ERD25TJ221	220	1	
R711		ERD25TJ391	390	1	
R715		ERD25TJ103	10K	1	
R716		ERD25TJ562	5.6K	1	
R717		ERD25TJ333	33K	1	
R718		ERD25TJ102	1K	1	
R719		ERD25TJ102	10	1	
R720		ERD25TJ562	5.6K	1	
R721		ERD25TJ101	100	1	
R722		ERD25TJ183	18K	1	
R723		EVLS6AA00B53	Variable 5K	1	
R724		ERD25TJ123	12K	1	
R725		ERD25TJ822	8.2K	1	
R726		ERD25TJ222	2.2K	1	
R727		ERD25TJ223	22K	1	
R728		ERD25TJ563	56K	1	
R729		ERD25TJ683	68K	1	
R731		ERD25TJ222	2.2K	1	
R732		ERD25TJ183	18K	1	
R733		ERD25TJ333	33K	1	
R734		ERD25TJ102	1K	1	
R735		ERD25TJ472	4.7K	1	
R736		ERD25TJ222	2.2K	1	
R737		ERD25TJ561	560	1	
R738		ERD25TJ471	470	1	
R739		ERD25TJ681	680	1	
R740		ERD25TJ682	6.8K	1	
			Capacitors		
C701		ECKR1H103PF	Ceramic 50V 0.01	1	
C702		ECCW1H560KC	Ceramic 50V 56P	1	
C703		ECEA1ES4R7B	Electrolytic 25V 4.7	1	
C705		VCY25153M	Semiconductor 25V 0.015	1	
C706		ECKR1H103PF	Ceramic 50V 0.01	1	
C707		ECEA1CS101E	Electrolytic 16V 100	1	
C708		VCY25473M	Semiconductor 25V 0.047	1	
C709		ECKR1H103PF	Ceramic 50V 0.01	1	
C710		ECCR1H470KC	Ceramic 50V 47P	1	
C711		ECEA1CS100E	Electrolytic 16V 10	1	
C712		ECEA1AS102E	Electrolytic 10V 1000	1	
C714		ECCW1H820KR	Ceramic 50V 82P	1	
C715		ECEA1ES4R7B	Electrolytic 25V 4.7	1	
C716		VCY25473M	Semiconductor 25V 0.047	1	
C717		ECKW1H103PF	Ceramic 50V 0.01	1	
C718		ECEA1CS101E	Electrolytic 16V 100	1	
C719		ECCR1H390KP	Ceramic 50V 39P	1	
C720		ECCW1H820JP	Ceramic 50V 82P	1	
C721		ECKR1H102PF	Ceramic 50V 0.001	1	
C722		ECKR1H103PF	Ceramic 50V 0.01	1	
C724		ECEA1ES4R7E	Electrolytic 25V 4.7	1	
C725		ECEA1HS010E	Electrolytic 50V 1	1	
C726		VCY25223M	Semiconductor 25V 0.002	1	
C727		ECKR1H472PF	Ceramic 50V 0.0047	1	
C728		ECKR1H103PF	Ceramic 50V 0.01	1	
C729		ECKR1H103PF	Ceramic 50V 0.01	1	
C730		ECKR1H472PF	Ceramic 50V 0.0047	1	
C731		ECEA1HS101E	Electrolytic 50V 1	1	
C732		ECKR1H102PF	Ceramic 50V 0.001	1	
C733		ECCR1H820JC	Ceramic 50V 82P	1	
C734		ECCR1H020CC	Ceramic 50V 2P	1	
C735		VCY25823M	Semiconductor 25V 0.082	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
C736		ECKR1H102PF	Ceramic 50V 0.001	1	
C737		ECCW1H180JC	Ceramic 50V 18P	1	
C738		ECCR1H150JC	Ceramic 50V 15P	1	
C739		ECCR1H100DC	Ceramic 50V 10P	1	
C740		ECCR1H120KC	Ceramic 50V 12P	1	
C744		ECKW1H102PF	Ceramic 50V 0.001	1	
C745		ECCW1H680KC	Ceramic 50V 68P	1	
C746		ECCD1H151KC	Ceramic 50V 150P	1	
			Coils		
L701		VLQ80F620K	62	1	
L702		VLQ80F330K	33	1	
L703		ELQS150KB	15	1	
L704		VLQ80F390K	39	1	
L705		ELQSR56KB	0.56	1	
L706		ELQSR47KB	0.47	1	
L707		VLQ80F4R7K	4.7	1	
L708		VLQ11	4.7	1	
L709		VLQ11 or VLQ3H4R7K	4.7	1	
			Transformers		
T701		EIV10S590F		1	
T702		EIV10S590G		1	
T703		EIV10S571Z		1	
T704		EIV10E208A		1	
			Filters		
FL701		EFC4R5MC3A		1	
FL702		EFCS4R5MS3		1	
FL703		EFCS4R5MW3		1	
FL704		EFCH45MVZ2		1	
			Miscellaneous		
		VJH23	Check Terminal	9	
P701		VJJ0020	RCA Pin Jack	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
P702,703		VJP0090	5 Pin Connector	2	
		VSC0355	Shield Case	1	
		VSC0356	Shield Case	1	
		VSC0357	Shield Case	1	

AUDIO HEAD CONNECTION C.B.A

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Resistor		
R6301		ERD25TJ100	10	1	
			Miscellaneous		
		TJE98101	Check Terminal	2	

RF CONVERTER CONNECTION C.B.A

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
		VJS1072	RF Edge Connector	1	

REAR JACK CONNECTION C.B.A

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Resistors		
R6304		ERD25TJ750	75	1	
R6308		ERD25TJ101	100	1	
			Miscellaneous		
P601		VJP0094	10 Pin Connector	1	

REEL SENSOR C.B.A

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Integrated Circuit		
IC6301		DN838		1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Resistors		
R6306		ERD25TJ682	6.8K	1	
			Miscellaneous		
P614		VJP0089	3 Pin Connector	1	
TAPE SLACK SWITCH C.B.A					
S6306		VSM0027	Micro Switch	1	
P613		VJP0092	3 Pin Connector	1	
SUPPLY PHOTO TR CONNECTION C.B.A					
			Transistor		
Q6302		PN150NV	Photo	1	
			Diode		
D6305		MA150	Si	1	
			Miscellaneous		
		TJE118	Check Terminal	1	
TAKE UP PHOTO TR CONNECTION C.B.A					
			Transistor		
Q6303		PN150NV	Photo	1	
			Diode		
D6304		MA150	Si	1	
			Miscellaneous		
		TJE118	Check Terminal	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
SENSOR LAMP C.B.A					
PL6301		XAMV12S	Sensor Lamp	1	
LOADING/UNLOADING COMPLETION SWITCHES C.B.A					
Q6304,6305		QSB0234	Leaf Switch	2	
P606		VJP0092	3 Pin Connector	1	
CAPSTAN MOTOR C.B.A					
P605		VJP0092	3 Pin Connector	1	
RF ENVELOPE TP'S C.B.A					
P622		VJP0092	3 Pin Connector	1	
		TJE118	Check Terminal	4	
POWER TR C.B.A					
Q6301		2SB512	Power Transistor	1	
P621		VJP0089	3 Pin Connector	1	
MEMORY SWITCHES C.B.A					
S6308		VST0011	Switch	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
LP/SP SELECT SWITCH C.B.A					
S6309		VST0017	Select Switch	1	
P620		VJP0092	3 Pin Connector	1	
TV/CAMERA INPUT SELECTOR C.B.A					
S6303		VST0012	Select Switch	1	
P603		VJP0094	10 Pin Connector	1	
P604		VJP0092	3 Pin Connector	1	
MIC JACK CONNECTION C.B.A					
			Resistors		
R6302		ERD25TJ331	330	1	
R6303		ERD25TJ104	100K	1	
			Miscellaneous		
P602		VJP0090	5 Pin Connector	1	
J6303		VJJ0021	Mic Jack	1	
AFC LAMP C.B.A					
D6303		GL52PG	L.E.D. (Green)	1	
LIGHT EMITTING DIODE C.B.A					
			Diodes		
D6301		GL52AY	L.E.D. (Yellow)	1	
D6302		GL52AR	L.E.D. (Red)	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
			Miscellaneous		
P608		VJP0092	3 Pin Connector	1	
ANTENNA SELECTOR C.B.A					
			Resistor		
		ERD25TJ750	75	2	
			Miscellaneous		
		ESB532	Switch	1	
		VJJ0020	RCA Pin Jack	3	
		VSC00260	Shield Case	1	
LOADING MOTOR CONNECTION C.B.A					
			Capacitors		
C6303,6304		ECQM1H333KZW	Mylar 50V 0.033	2	
			Miscellaneous		
		VJP0092	3 Pin Connector	1	
AUDIO/CONTROL HEAD CONNECTION C.B.A					
P612		VJP0094	10 Pin Connector	1	
ELECTRIC PARTS LOCATED ON CHASSIS					
		NV-U234Z	RF Converter	1	
		TNT7601	VHF Tuner	1	
		TNK36121E	UHF Tuner	1	
		VEQ0154	Timer	1	

Ref. No.		Part No.	Part Name & Description	Pcs / Set	Remarks
		ETP66EL1A or MUM013	Power Transformer	1	
		VEC121	AFT Switch	1	
		QSW0108USA	Power Switch	1	
		EVHR7AK15B15	Tracking Control Volume	1	